The Beginners Compendium of Non-Toxic Intaglio Printmaking

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Adams currently teaches photography and printmaking at the University of Indianapolis.

The Beginners Compendium of Non-Toxic Intaglio Printmaking
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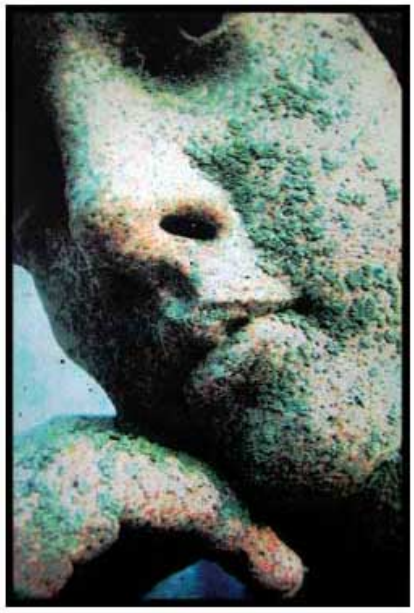
Part One: Intaglio Type

Intaglio Type



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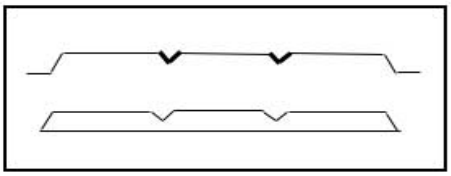
Intaglio Type

1. Compared to Traditional Intaglio

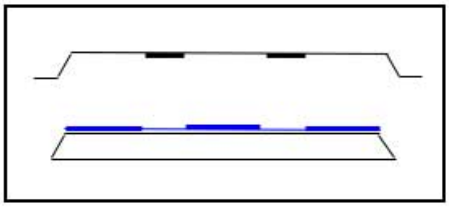
Traditional Intaglio
Intaglio (from the Italian *intagliare*, to cut) is a category of printmaking techniques that create depressions in a flat metal plate to hold ink. Intaglio techniques include engraving, drypoint, mezzotint and aquatint. Traditional etching, the fastest and most preferred technique, requires exposure to toxic chemicals, including nitric acid to chemically etch exposed areas of the plate, and asphaltum to resist etching. After depressions are created, the indented plate is coated with ink and excess ink is wiped from the plate's surface. The inked plate is covered with a dampened sheet of paper and run through a press which pushes the paper into the plate's recessions, transfers ink to the paper, creates a reversed image and embosses the paper. Reworking a traditionally etched plate is tedious and time-consuming.

The simplified cross-section (*top right*) represents the indented plate below the print. The paper shows the characteristic embossing which results from the pressure of the press. Thick lines represent ink transferred to the paper under pressure.



Intaglio-Type Non-Etch Intaglio
Keith Howard introduced the term Intaglio-Type to describe a broad range of non-etch intaglio techniques that do not require the toxic chemicals associated with traditional etching. Intaglio-Type relies on a photopolymer (i.e., light sensitive film) laminated to a flat plate, exposed to ultraviolet light through a stencil and developed in a mild solution of soft water. Ink is held differentially by the developed film and the image transfers in reverse onto paper under the pressure of the press. Plates are easily and quickly re-worked.
The unaltered plate is recycled after the film is stripped away.

The simplified cross-section (*right*) represents the developed film (blue) on the plate (below) and the printed paper (above). The paper shows the characteristic edge embossing which results from the pressure of the press. Thick lines on the paper represent ink transferred to the paper under pressure.



Intaglio-Type permits continuous-tone imagery as well as imagery similar to mezzotint and aquatint. Non-etch explorations with the photopolymer by Keith Howard and his students have revitalized printmaking by permitting unique imagery not previously imagined, including Wash-Drawing Intaglio-Type, Pastel Intaglio-Type, Spit-Bite Intaglio-Type, Mezzo Intaglio-Type, Stencil Intaglio-Type, Aquatint Intaglio-Type, Layered Intaglio-Type, Construction Intaglio-Type, Direct Intaglio-Type, Crackle Intaglio-Type and Wrinkled Intaglio-Type.

The following pages explore the processes and potential of Non-Etch Intaglio-Type.

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Intaglio Type

2. ImagOn Photopolymer and Plates

ImagOn is a photopolymer film originally developed by Dupont for computer circuit boards; it permits etched as well as non-etch imagery unique to Intaglio-Type. As shown in the photo (*right*), ImagOn consists of a blue emulsion sandwiched between a soft peel-back layer (*top of photo*) and a crisp, clear Mylar (*bottom of photo*).

This photopolymer has evolved over time. All generations of ImagOn function in basically the same way. The peel-back layer is removed so ImagOn can be laminated to a flat surface. A stencil is laid on the protective top Mylar surface and the plate is exposed to ultraviolet light. The top Mylar is removed for development of the photopolymer in a mild solution of soft water. During development, the film is eaten away where the stencil blocked the ultraviolet light from the film; these areas hold ink. Areas exposed to UV light harden and do not hold ink. White vinegar neutralizes the developer and stops development.

Plates for ImagOn
For non-etch Intaglio-Type techniques, ImagOn is laminated to a flat, non-porous substrate. Traditionalists may prefer to laminate ImagOn to the metal plates associated with traditional intaglio. Newer, less expensive and more easily prepared plates are generally preferred, such as 0.022 gauge roofing copper, computer circuit boards or 0.03 ml thick P.E.T.G. (a thermoplastic). Plexi-glass is unsuitable since it contains oils that prevent lamination.

Plate Preparation
ImagOn will not adhere to oily surfaces, so any substrate must be degreased prior to laminating. Traditional plates require more edge preparation and degreasing.

Materials and equipment
Materials include a liquid dish detergent, such as Palmolive; sponge; paper towels; white vinegar in a spray bottle. Preparing traditional metal plates requires an electric finishing sander and 600-grit wet-dry sandpaper, a deburring tool, and a rat-tail file.

Preliminary steps for traditional metal plates

- Bevel the edges with a deburring tool; or file, scrape and burnish to avoid harming the press.
- File the sharp corners to avoid harming the press and personal injury.
- Sand the surface with a circular motion of the rotary sander; use water to avoid the health hazard of creating dust.

Steps for all plates

- Wash the plate thoroughly with dish detergent.
- Rinse the plate with water.
- Degrease the surface by spraying liberally with white vinegar (*photo opposite*).
- Rinse; wipe dry with a clean paper towel.

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3. Spray Lamination

The first step in preparing ImagOn for Intaglio-Type is lamination to a prepared plate. Two basic methods are available for lamination: spray lamination and immersion lamination. Although the two methods are interchangeable, the spray lamination is generally preferred for smaller plates. For either method, work in a location far removed from direct sunlight to avoid exposing the photopolymer to ultraviolet rays that would fog the film.

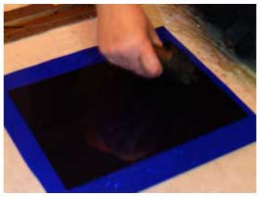
Materials and equipment
Materials for spray lamination include: a clean, non-sticky and non-porous working surface, such as ¼ inch thick glass; brown packing tape or other 2 inch-wide tape; ImagOn; scissors; sharp knife with snap-off blades; water in a spray bottle; a prepared plate; and a 4 inch-long neoprene, medium-hard screenprinting squeegee.


Steps

- Place a 6-8 inch long section of 2 inch-wide packing tape sticky side up against the edge of the workspace. Hold the tape in place with a section of tape across each end.
- Cut a section of ImagOn slightly larger than the plate. Handle the film carefully to avoid causing creases or dimples that would interfere with bonding.
- Begin removing the soft peel-back layer by rubbing a corner of the peel-back layer against the tape (*above left*).
- Separate the corner of the film from the peel-back layer without disturbing the top Mylar (*above right*).
- Spray the work surface liberally with water.


- Place a prepared plate on the work surface and spray the plate liberally with water to aid in repositioning the film (*above left*).
- Place the film with emulsion facing up on the work surface and spray liberally with water to aid in repositioning, optional (*above right*).





- Gently position the film on the plate with the top Mylar facing up (*above left*). If wrinkles form or air bubbles develop, lift and reposition the film as necessary.
- Spray the top Mylar liberally with water to reduce friction (*above middle*).
- Adhere the emulsion with a squeegee using quick, light strokes; work from the center outward in all directions to remove any air bubbles (*above right*) Repeat, increasing pressure without introducing wrinkles in the film.

- Turn the plate over; trim the emulsion with a blade so the emulsion does not extend beyond the plate edge. Lift and discard trimmings (*opposite*).
- Turn the plate over so the top Mylar faces up and squeegee again.
- Push down on any remaining bubbles with a clean, lint-free cloth; pay particular attention to the edges (*bottom photo*).
- Pat both sides of the laminated plate dry with a paper towel.
- Heat dry the plate with a hand dryer or hair dryer at the highest setting for 1 minute per square foot from the back side first and then the front. Avoid this step for P.E.T.G. plates since they warp, and may even melt, with excessive heat.
- Run the laminated plate through the press with the top Mylar facing down to promote adhesion.
- Leave the plate in a cool, dark location overnight to increase bonding.
- The laminated ImagOn plate is now ready for exposure in the UV exposure unit.


Note: The exposed plate is usually developed immediately after exposure and the developer is made a day ahead for best results, so it is a good idea to make new developer on the same day that the plate is laminated.

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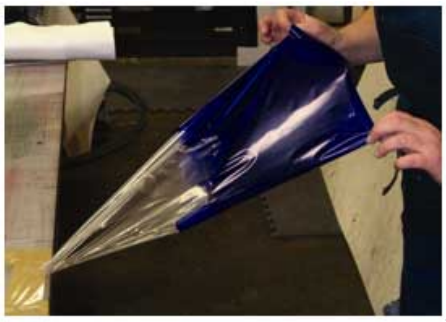
4. Immersion Lamination

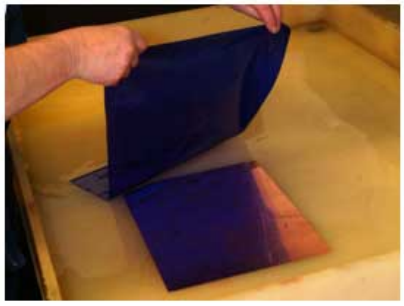
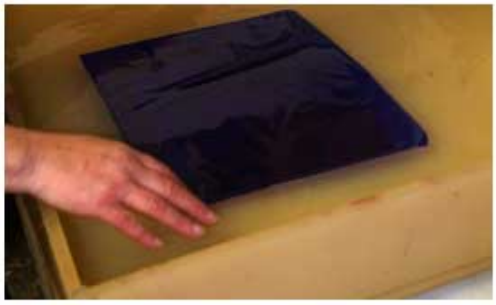
Immersion lamination is generally preferred for laminating ImagOn to larger plates. Remember to work in a location far removed from direct sunlight to avoid exposing the photopolymer to ultraviolet rays that would fog the film.

Materials and equipment
Materials and equipment for immersion lamination include: a clean, non-sticky and non-porous working surface, such as ¼ inch thick glass; brown packing tape or other 2 inch-wide tape; ImagOn; scissors; sharp knife with snap-off blades; tray larger than the plate; prepared plate; water in a spray bottle; and a 6 inch long neoprene medium hard screen-printing squeegee.

Steps

- Begin by filling the large tray with fresh water. Be sure the tray is free of small particles that would interfere with adhesion.
- Place a degreased plate in the tray of water (*above left*).
- Position a section of 2 inch-wide packing tape approximately 6-8 inch long sticky-side-up against the edge of the workspace. Hold the tape in place with a section of tape across each end.
- Cut a section of ImagOn slightly larger than the plate. Handle the film carefully to avoid creating creases or dimples that would interfere with bonding.
- Begin removing the soft peel-back layer by rubbing a corner of the peel-back layer against the tape; separate a corner of the emulsion from the peel-back layer without disturbing the top Mylar. Pull back to separate the film and Mylar top from the peel-back layer (*above right*).

- Position the film on the water over the plate (*above left*).
- Float the film on top of the water over the plate with the top Mylar facing up (*above right*)
-
- Pat the film to remove air bubbles beneath it (*opposite, top photo*).

- Lift the plate and film together from the water. Lift from below to avoid crimping the film against the plate (*opposite, second photo*).

-

- Position the plate and film on the work surface with the top Mylar facing up and spray the mylar liberally with additional water to reduce friction.
- Reposition the film as needed to remove air bubbles or wrinkles.

- Adhere the emulsion to the plate with a squeegee using quick, light strokes from the center outward to remove air bubbles and avoid wrinkles (*opposite, third photo*). Repeat, increasing pressure to promote bonding.

- Turn the plate over and trim the emulsion with the blade so it does not extend beyond the edge of the plate; lift and discard the excess film (*opposite, fourth photo*). Turn the plate so the top Mylar faces up and squeegee again.

- Push down on any remaining bubbles with a clean, lint-free cloth (*bottom photo*). Pay particular attention to any edge bubbles.
- Pat both sides of the laminated plate dry with a clean paper towel.
- Heat dry the plate with a hand dryer or hair dryer at the highest setting for 1 minute per square foot from the back side first and then the front. For large metal plates, use a heat gun held at least 6 inches from the plate and move continuously to avoid melting the ImagOn. Avoid the heating step for P.E.T.G. plates since they warp, and may even melt, with excessive heat.
- Run the laminated plate through the press with the top mylar facing down to promote adhesion. Leave the plate in a cool, dark location for 24 hours to increase bonding. The laminated ImagOn plate is now ready for ultraviolet exposure.

Note: The exposed plate is usually developed immediately after exposure. The developer is made a day ahead; for best results, make new developer the day the plate is laminated.

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5. Exposure Units

The laminated photopolymer plate is exposed to ultraviolet light with a stencil in place. A variety of exposure units (also called plate-makers) are available for this purpose.

There are three requirements for an exposure unit. The unit needs a point-light source that emits ultraviolet light. (Note: a fluorescent light source does not work since fluorescent light is a soft light that burns under each dot of the stencil.) A vacuum system is required to ensure close contact between the photopolymer plate and the stencil so light cannot sneak under the stencil, which would burn out the image. An integrator measures the quantity of light emitted (i.e., light units) rather than the length of time light is emitted (i.e., seconds), which ensures that the amount of emitted light remains predictable and repeatable as the bulb ages. It is possible to construct your own exposure system but a variety of new or used exposure units are available.

Olec
Olec makes a variety of exposure units equipped with a light integrator. The light is positioned above the vacuum table. Lower-end models use a 1000- watt Quartz Halogen bulb; more expensive models use a metal halide bulb. The intensity and quantity of light is easily set with conveniently located buttons. After the plate and stencil are placed on the vacuum table, a glass cover is closed and the vacuum is pulled at the push of a button. The first photo (*left*) shows a desktop model. The larger model (*middle photo*) uses curtains to protect the user from the UV light.

NuArc
NuArc make flip-top exposure units. After placing the plate and stencil on the vacuum table, the user presses a button to pull a vacuum and then flips the vacuum table upside down so the plate faces the metal halide bulb located at the bottom inside the unit. Conveniently located buttons are used to set the light units and start the exposure. The bulb will not activate unless the vacuum table is flat so the user cannot be exposed to ultraviolet rays. The third photo (*right*) is a NuArc flip-top exposure unit.

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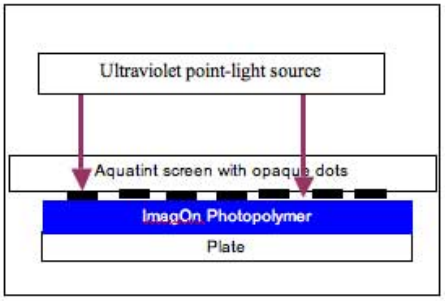
6. Aquatint Screen Exposure

After the ImagOn is laminated to a prepared plate, the photopolymer is ready for exposure to ultraviolet light to create a latent image in the film. Some stencils require only one exposure, such as fine graphite stippling drawings, fine graphite line drawings, narrow text (less than 1/8 inch or so wide), and half-tone inkjet transparencies - stencils without solid, unbroken areas of black that would open bite. Other images require two exposures: the first with an aquatint screen and the second with the image stencil.

The Aquatint Screen
An aquatint screen is a stencil with an opaque random dot structure. The dots are organic and of variable sizes. An aquatint screen can be designed in PhotoShop and printed on an inkjet transparency but it is easily scratched. A more durable aquatint screen (designed by Elizabeth Dove) is printed with 70% coverage of organic, opaque, random dots at 2400 dpi on a film (vs. transparency) with an imagesetter laser. Handle an aquatint screen carefully by the edges. Clean it gently with soap and water or rubbing alcohol, as needed.

How an Aquatint Screen Exposure works
An aquatint screen exposure works in the same way aquatint works in traditional intaglio, to break up solid areas and avoid open biting. The simplified cross-section (*right*) represents an aquatint screen exposure. The aquatint screen is positioned emulsion-to-emulsion over the laminated ImagOn. The aquatint screen's opaque dots block ultraviolet light from reaching the film during exposure (represented by the short arrow above the black dot) but ultraviolet light reaches the film in the spaces between the dots (represented by the long arrow). The film remains soft below the dots but hardens in the openings between dots.



If no image exposure follows the aquatint screen exposure, the film comes off below the dots during development, creating valleys that hold ink so the entire surface appears as richly black as traditional mezzotint.

Standard Aquatint Screen Exposures
Once the standard aquatint screen exposure has been determined, follow these exposure steps:

- Turn the platemaker on so it warms up.
- Lift the lid on the vacuum table and position the ImagOn plate on the vacuum table with the Mylar facing up. Place the aquatint screen on the plate emulsion-to-emulsion.
- Set the platemaker for the standard light units as determined by the step-test, pull a vacuum, and make the exposure. Remove the aquatint screen and proceed to the image exposure.

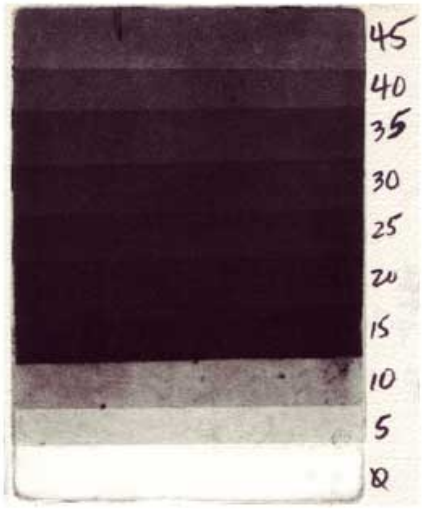
Determining the Standard Aquatint Screen Exposure
A step test is necessary to determine the best aquatint screen exposure to produce the blackest black for each unique combination of platemaker and aquatint screen. Once determined, the exposure remains constant for all future aquatint screen exposures made with the same platemaker and aquatint screen.

Materials
The step-test requires: laminated ImagOn plate; ruler; fine-point magic marker; aquatint screen larger than the plate; 2 pieces of Rubylith or other opaque flat material cut large enough to cover the plate with at least 1 inch extra on all sides; and exposure unit.

Steps

- Turn the platemaker on ahead so it warms up.
- Mark ½ inch or 1 inch divisions on the top Mylar.
- Lift the lid on the vacuum table and position the ImagOn plate on it with the Mylar facing up; close the lid.
- Place the aquatint screen on the plate emulsion-to-emulsion. Cover the bottom strip with rubylith so it is not exposed. Working from the bottom, cover all but the second division with the second rubylith.
- Set the platemaker for a 5 light units, pull a vacuum, and make the exposure.
- Move the two pieces of Rubylith to expose the third division from the bottom of the plate. Set the unit for 10 light units, pull a vacuum and expose the plate.
- Continue in this manner, adding 5 light units to each subsequent exposure.
- Develop and print the plate. Note the darkest black on the print. If two or more are equally dark, choose the one with the least light units.
- Repeat the process with 1-light-unit increments around the best exposure.
- Develop and print the second plate. Note the darkest black. If two or more are equally dark, choose the one with the least light units. This becomes the standard aquatint screen exposure for all future plates with this

platemaker and aquatint screen.



The photo (*above right*) is a print made from an aquatint screen step-test.
The bottom strip was not exposed; the top strip received 45 light units.
The print is light in strips with low exposures where the plate did not receive enough light to harden.
The print appears lighter again at high exposures where the plate hardened too much to hold ink well.
The blackest tone appears at 15 light units.
A refined one-unit step test followed from 13-19 light units.
The standard aquatint screen exposure with this platemaker and aquatint screen was determined to be 19 light units.

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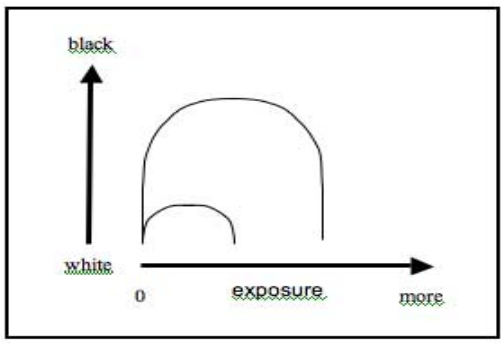
7. Image Exposure

After ImagOn is laminated to a prepared plate, the photopolymer is ready for exposure to UV light with a stencil in place to create the latent image in the film. Image exposure immediately follows an aquatint screen exposure, if needed (See previous topic: Aquatint Screen Exposure).

Stencils
Any medium that permits light to pass through in some areas while blocking light in other areas can serve as an image stencil. Appropriate image stencils include graphite, charcoal or pastels on drafting Mylar, tracing paper, or typing paper rubbed with oil. Inkjet transparencies of photographs and xerographic copies on transparencies also work well. Flat objects, such as lace, leaves, Rubylith or torn paper can even serve as stencils. The best way to determine a medium's suitability is to experiment!

The photo (*right*) shows a print made with an aquatint screen exposure followed by an image exposure with puzzle pieces positioned on the plate as the image stencil. The print is white where UV light reached the plate during image exposure and black where puzzle pieces blocked the UV light during image exposure.

How image exposure works
A properly exposed plate reveals the full tonal range of the image. Unexposed film comes off the plate during development, so an unexposed plate would print as white. Over-exposed film hardens too much to hold ink well.



The simplified drawing (*left*) shows the effect of exposure on light tonal values (the lower arch) and on dark tonal values (the higher arch). With no exposure, the print would show white for all tones in the image. Light tones do not need much exposure to achieve the correct value and, beyond that, they harden so much that they do not hold ink well so they print increasingly lighter until they print as white. Dark tones need a longer exposure to achieve the correct value and, beyond that, they also harden too much to hold ink well so they print increasingly lighter until they print as white. Under-exposed images do not develop rich blacks. Over-exposed images lose the light tones first and eventually the dark tones as well. For images with the full tonal range, a compromise may need to be made between keeping the light tones and achieving the richest black.

Open-biting is the term for areas falling off the plate during development because of insufficient exposure. Burn-out is the term for film that becomes so hard during exposure that it will not hold ink. Both result in white areas that should show tonality.

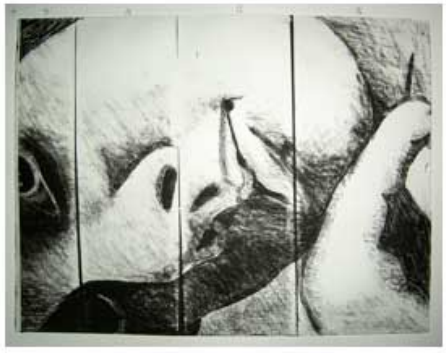
Step-tests for image exposures
Stencils have different densities to light so each image must be tested for the best exposure to produce its full tonal range. For best results, always make a step test for each new image, even when using a previously tested medium.

Materials
Image step-tests require: a laminated ImagOn plate (exposed with an aquatint screen if the image includes solid areas of black); image stencil; scotch tape; and two pieces of Rubylith or other flat, light-blocking material.

Steps

- After removing the aquatint screen, position the image stencil on the plate emulsion-to-emulsion and tape in place.
- Position the Rubylith matte-side-down to cover all but the lowest one-sixth of the stencil; expose the bottom strip for 5 light units.
- Cover the exposed bottom section and reveal only the next one-sixth strip; expose this section for 10 light units.
- Continue individually exposing the four remaining sections in the same manner, adding 5 additional light units to each new section until all six sections have been exposed.
- Develop and print the plate to determine which exposure gives the best tonal range.
- For best results, make a second step-test of 1-unit increments around the exposure with the largest tonal range.

Note: occasionally, a very dense substrate requires more than 30 light units to yield a rich black; in this case, repeat the step-test process with stronger exposures.



The photo (*top right*) is an image step-test in process. The stencil is a graphite drawing on tracing paper. The image includes solid areas of black so the film received a standard aquatint screen exposure prior to the 5LU step-test for image exposure. Rubylith covers the bottom two sections that have already been exposed; a second piece of Rubylith covers sections not yet exposed.

The photo (*bottom right*) shows a print made with a more refined step-test plate for the same subject.

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8. Mix the Developer

After exposure with an image, develop the ImagOn plate in a mild, soft water solution of sodium carbonate (also called soda ash or washing soda) and water. Mix the developer a day ahead. To avoid sensitivity to soda ash, you may prefer to wear protective gloves when working with developer.

Materials
Mixing the developer requires: gram scale (*top photo*); protective gloves; spoon; stirring device; 1-liter marked measuring container; flat darkroom tray large enough for ImagOn plates; flat, opaque lid for the tray; anhydrous soda ash, available from printmaking suppliers, swimming pool suppliers, or from the grocery as washing soda.

Recipe
For water with a pH of 7, mix 10 grams anhydrous soda ash for each liter of water. Mix this proportion for the first batch of developer using the studio's tap water. Adjustments will be made later.

Steps

- Run tap water until it is hot; pour ½ liter of hot water in the measuring container.
- Spoon anhydrous soda ash into the gram scale until it measures 10 grams (*second photo*).
- Add the measured soda ash to the container with hot water (*third photo*).
- Stir until the soda ash is dissolved (*bottom photo*).
- Fill the container to 1 liter with room temperature water. Pour the water into the darkroom tray.
- Cover the tray.
- Leave the developer overnight so it comes to room temperature. Set the room temperature so the developer will remain between 65°- 70°F.

Testing the developer
Distilled water is pH7. If anhydrous soda ash were mixed with distilled water, the correct proportion would be 10 grams soda ash per liter of water. However, it is less expensive and more convenient to use studio tap water. The

pH of tap water depends on the water supply, so the exact proportion of soda ash to water needs to be determined for your studio. This is a one-time test, unless the chemistry of the tap water changes. Begin the test with 10 grams soda ash per liter of water and make adjustments to the proportions depending on whether the studio's tap water is hard or soft. After mixing the first batch of developer, proceed to the one-time developer test, which is the next topic.

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9. Test the Developer

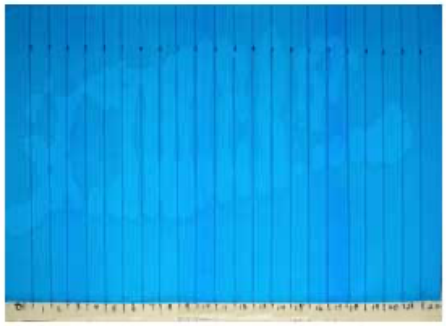
Test the developer for the studio's tap water since the hardness of the water varies with location - this is a one-time test unless the quality of tap water or the studio changes. When testing the developer, work in low-level light away from open windows. Wear protective gloves. The ImagOn plate is never exposed or printed for the developer test.

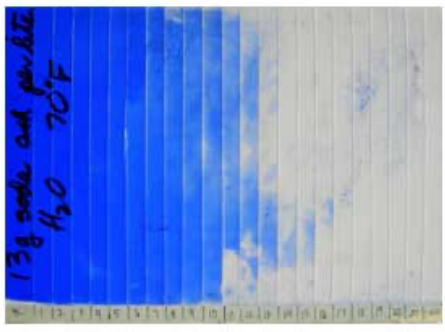
Materials

Testing requires: protective gloves; 9 x 12 inch laminated ImagOn plate; 1 inch masking tape; blade; ruler; permanent marker; darkroom or kitchen timer; 10 grams per liter water developer mixed a day ahead (see previous topic); white vinegar in a spray bottle; paper towels; commercial hand dryer or heat gun.

Steps

- Pull back ½ inch of the top Mylar along one entire long edge of the laminated plate.
- Position masking tape on the film along the entire length of the plate below the pulled-back edge and fold the masking tape over to the plate's backside.
- Fold a second piece of masking tape over the pulled-back edge of Mylar.
- Measure and mark ½ inch increments on the Mylar beginning with the taped edge. Cut through the tape and Mylar along the marked increments.
- With the marker, label the Mylar tabs sequentially 0, 1, 2, 3, etc., to 22. Label the masking tape below the tabs with matching numbers. The *top photo* is the plate ready for testing.
- Set the timer for 22 minutes and activate it.
- Lift the tab and remove the entire strip of Mylar marked 22. Immediately insert the plate in the developer. Cover the tray for one minute.
- Uncover the tray. Remove the Mylar strip marked 21 without lifting the plate from the developer; cover the tray. Continue removing one Mylar strip for each minute until all but the 0 strip have been removed for one minute. Lift the plate from the developer; remove the strip labeled 0. The *middle photo* shows the removed Mylar strips.
- Rinse the plate in cool water. Spray it with white vinegar and rub for 30 seconds. Rinse in cool water. Pat dry with a paper towel. Set the plate in sunlight to dry for half an hour.
- Examine the plate: 80% of the film should disappear by the strip marked 13; all film should be gone by 15. If this occurs, the standard developer in your studio is balanced at 10 grams of soda ash per liter of water. If the film disappears before the strip labeled 13, make a new developer solution with slightly less soda ash and re-test. If it disappears after 15, make a new developer with slightly more soda ash and re-test. The *middle photo* shows the strips after removal. The *bottom photo* is the developed plate.





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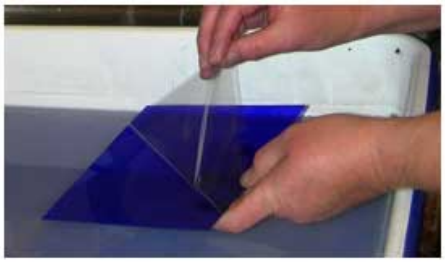
10. Standard ImagOn Development



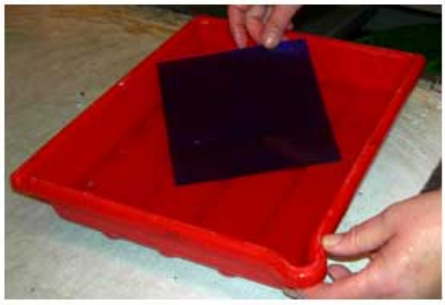
After the ImagOn plate is exposed, it is ready to be developed in the standard developer as determined by the one-time developer test; if you are not going to develop the plate immediately, store it in a cool, dark location. The mild soft-water developer solution of soda ash is slightly base. White vinegar is slightly acidic; it stops development and stabilizes the film. Note: A few intaglio-type techniques require a variation on standard tray development procedures; these variations will be indicated in topics discussing those techniques.

Materials

Developing requires: gram scale; spoon; long stirring device; 1-liter marked measuring container; an exposed ImagOn plate; flat darkroom tray larger than the ImagOn plate; flat, opaque lid for the tray; darkroom or kitchen timer; anhydrous soda ash; white vinegar in a spray bottle or ½ inch deep in a darkroom tray larger than the plate; sponge; paper towels; commercial hand dryer or heat gun.

Steps

- The day before exposing the plate and developing, prepare the standard developer as determined by the developer test. Cover the tray and leave it overnight.
- Expose the plate in the exposure unit. Set the timer for 9 minutes.
- Remove the top Mylar by rubbing it back from a corner and lifting off the film (*top photo*). Alternately, apply a small piece of masking tape to a corner of the Mylar and lift off.
- Immediately insert the plate in the soda ash solution and cover the tray.
- Turn the timer on. Do not disturb the developing plate. After 9 minutes, lift the plate from the developer and rinse the plate in cool water briefly (*second photo*).
- Spray white vinegar over the entire plate or place the plate in a tray of white vinegar (*third photo*).
- Rub the vinegar over the entire plate surface.
- Rinse the plate in cool water briefly.
- Pat both sides of the plate dry with a paper towel.
- Heat-dry both sides of a metal plate with a commercial hand-dryer or a heat gun held at least 6 inches away (*bottom photo*). Be careful with the heat gun to avoid melting the film. Alternately, set the plate in sunlight for half an hour or more. Do not heat P.E.T.G.
- Leave the developed plate overnight in the studio to harden the film. The developed plate is now ready for inking and printing.



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11. Paper Preparation

Paper Choices

Atlantic Papers provides excellent mould-made deckle-edged papers for printing Intaglio-Type plates with Akua inks, including Hahnemühle Durer Etching, a 300-gm. 100% cotton paper, and Hahnemühle Copperplate, a 300-gm alpha cellulose fiber requiring minimal soaking. Hahnemühle Biblio, a thinner alpha cellulose fiber can be used for proofing plates.

Akua inks may be printed dry with slightly more pressure during the printing process; this produces a more contrasted image without plate tone. The paper is usually printed damp, which produces a more complete tonal range and plate tone. Wetting requires less time for Akua inks than for oil inks: 1-15 minutes for Hahnemühle Copperplate.

Materials for paper preparation
Materials for paper preparation vary with the method: printing stock; tear bar; blotters or clean, dry, large white towel; Plexiglas drain board; window cleaning squeegee.

Steps for changing paper dimensions
Hahnemühle Copperplate is available in sizes 22 x 30 inch or 31 x 47 inch but can be torn to smaller sizes with a tear bar.

- Stack the sheets of paper stock to be torn.
- Fold the top sheet of paper stock in half and then unfold it - this is easier than measuring the halfway point.
- Hold a tear bar with the sharp edge (or long straight edge) against the fold.
- Tear the paper to the desired size by lifting and gently pulling the top corner toward the sharp edge (*below left*).



Steps for making a wet pack
Prepare a wet pack a day ahead for consistent dampened sheets when they will be used within a couple of days. Always handle wet paper by two corners to avoid crimping the paper.

- For small sheets: insert the sheets in a wet sink or tray of water for at least one minute (*middle photo*). Stack the wet sheets on a clean surface or alternate wet and dry paper. Store the wet pack of small sheets in a plastic bag. Remove one sheet at a time and blot it with a towel or blotter paper as described below. Note: If necessary, the wet pack can be stored for up to a week in a refrigerator without growing mold or fungus.
- For large sheets: Soak in water 15 minutes. Roll up the first sheet and lift it from the water; unroll on a clean surface. Squeegee each sheet with a window squeegee before stacking another. Cover the wet-pack with clean Plexiglas and weight the wet pack. Calendar each sheet just before printing: lay a sheet on the press, cover with clean paper, run through the press once (*above right*).

Steps for smaller damp paper
Another option is to prepare one sheet of small paper stock at a time.

- Insert a sheet of paper stock in water.
- Remove the sheet of paper stock from the water after 1 minute.
- Place the wet paper on a Plexiglas drain board and squeegee with a window-cleaning squeegee, if desired (*opposite, top photo*), or hold the paper over the water to drain it.

- Place the sheet in a folded clean towel (*second photo*).

- Press gently from the center of the paper outward in all directions until no shiny spots remain on the paper (*third photo*).
- The sheet of paper stock is now ready to print.

Steps for larger damp paper
Use the following method to prepare one large sheet of paper stock at a time.

- Insert one sheet of large paper in water.
- Remove the sheet of paper after 15 minutes. Place it between two blotters (*fourth photo*).

- Roll back and forth over the top blotter with a roller until no shiny spots remain on the paper (*bottom photo*). The sheet of paper stock is now ready to print.
- If the sheet will be used for multi-plate printing, lay it on a clean press and run it through the press once to calendar the paper before printing.

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12. Ink the Plate

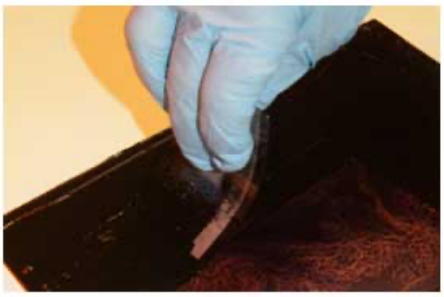
The ImagOn plate is ready to ink after it has been developed and left overnight to harden.

Akua Inks and Modifiers
Akua Intaglio inks are made with pigments in a soy binder. They are non-toxic, light fast, waterproof when dry and permanent. They contain no drier and do not form a skin. They are easy to apply, wipe, and clean up. Akua Intaglio inks can be stiffened by mixing in a small amount of Akua Oil Converter with a palette knife. To make them looser, mix in a few drops at a time of Akua Blending Medium with a palette knife. Colors may be used alone or blended. Add a couple drops of Akua Blending Medium to facilitate blending colors. Akua Transparent Base may be mixed in with a palette knife to reduce intensity.

Materials and equipment
In addition to inks and modifiers, inking the plate requires: glass or other smooth working surface; protective gloves; 2 x 2 inch sections of matboard or P.E.T.G. or a charge card; unsized tarlatan or 100% polyester pellon; phone book pages or newsprint.

Steps

- Place the developed and hardened plate on the smooth workspace with the inks and other materials. Blend any colors and add any modifiers. Never add water to the inks. Stir the ink when beginning and every hour or so.
- Before inking the plate the first time and between prints, wipe the plate with clean pellon or tarlatan (*top photo*).



- Dip one end of the matboard or charge card into the ink and spread a thin layer of ink on the plate (*second photo*).

- Wipe excess ink from the surface with unsized tarlatan or pellon using gentle pressure (*third photo*). Akua inks do not require the wiping pressure of oil-based inks.

- Finish wiping with a new tarlatan or pellon; or do the final wipe with circular motion of newsprint or pages from a phone book (*bottom photo*). Note: if wiping yellow from the plate, prefer clean newsprint since phone book pages will color the ink. When inking and handling an inked plate, avoid touching the inked surface, which would leave fingerprint impressions in the print.
- Wipe the edges of the plate with a clean pellon. The inked and wiped plate is now ready to print.
- After printing, clean ink from surfaces and plates with soapy water followed by water.

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13. Print the ImagOn Plate

When the inked plate is wiped and the paper is prepared, bring the plate to the etching press to pull a print.

The Press
A manual or electric etching press provides the pressure for printing. A sheet of Plexiglas covers the press bed to protect it. A wool pusher blanket and a layer of vinyl are usually positioned under the roller but Keith Howard has also developed a rotational blanket system that keeps the blankets up out of the way when not printing (*top photo*).

Materials
Printing requires: an etching press, an inked plate, prepared paper, and clean newsprint.

Steps

- Be sure the press bed and vinyl layer are clean.
- Lay a sheet of clean newsprint on the press bed.
- Place the inked plate on the newsprint (*second photo*).

- Place the prepared paper carefully over the inked plate. Use small folded pieces of paper or matboard to protect the paper from ink stains when handling the paper (*third photo*).

- Electrically or manually run the plate through the press (*fourth photo*).

- Gently lift the print from the plate (*fifth photo*). It is now ready to be dried.
- Before leaving the press for the day, clean the press bed and vinyl with soapy water; rinse; dry with a clean paper towel.
- Take the pressure off the press when not in use.

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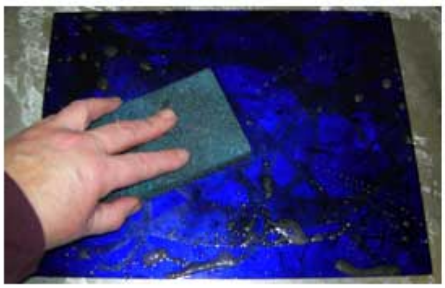
14. Remove Akua Inks

Akua inks are easy to remove from plates and work surfaces after printing is completed.

Clean the plate
If the plate will be used again in the next few days, there is no need to remove ink from the plate surface. If the plate will be stored for a longer period of time or recycled, clean the plate.

Materials
Cleaning the plate requires: liquid dish detergent, such as Palmolive; sponge; paper towels.

Steps



- Pour a few drops of liquid dish detergent on the plate. Rub with a wet sponge - gently if the plate will be reused (*photo opposite*).
- Rinse the plate.
- Pat the plate dry with a paper towel if the plate may be required for future printing.
- Store the plate in a cool, dry location for future use.
- If the plate will not be required for future printing, reclaim the plate by stripping the ImagOn photopolymer from the plate - see the next topic.

Clean other inky surfaces
After printing, clean ink from all work surfaces, the press bed, protective vinyl on press and any tools with soapy water.

Materials
Cleaning requires a liquid dish detergent; spray bottle; paper towels; clean, dry cloth rag (optional).

Soapy water recipe
Add approximately one part liquid dish detergent to six parts water in a spray bottle.

Steps

- Spray soapy water on the inky surfaces.
- Remove ink and soapy water by gently rubbing with a sponge.
- Rinse with water on a sponge.
- Dry inky surfaces with clean paper towel or with a clean, dry cloth rag.
- Store the plate in a cool, dry location if it will be used again later. When the plate will not be required for later printing, recycle the plate.

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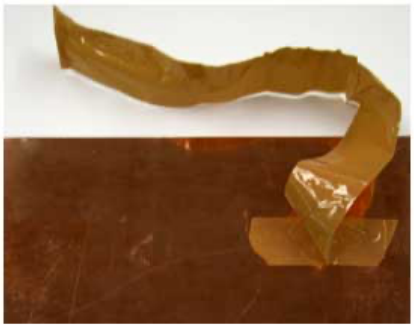
15. Reclaim the Plate

When the image will not need to be printed again, remove ink from the plate and then strip the film from the plate. This permits recycling the plate. The stripping solution is merely a stronger solution of developer. Wear gloves when mixing stripping solution and removing plates from the stripper.

Materials and equipment
Stripping the plate requires: a measured container; stirring device; balance scales; soda ash (i.e., calcium carbonate, also called washing soda - the same chemical used in the developer); polypropylene tank or other container deep enough to cover plates; packing tape; scissors or blade; and clothes pins.



Stripping solution recipe

- Add one part soda ash to four parts hot water by volume in a measured container.
- Stir until the soda ash dissolves.
- Pour the solution into a vertical polypropylene tank or other container deep enough to cover plates.

Note: Stripping should take only a few hours. When stripping requires a longer period of time, discard the solution and make a new stripping solution. To avoid clogging the drain, insert a screen in the bottom of the sink to catch the stripped film when pouring old stripper down the sink.

Steps for stripping ImagOn from the plate

- Cut a long section of packing tape.
- Make a tape handle on the back of the plate (*top photo*).
- Insert the plate into the stripper so it is covered by solution.
- Attach the plate's tape handle to the side of the tank top with a clothes pin. Write your initials on the tape with a permanent marker if the studio space is shared. The photo on the *left* shows the tank; the photo on the *right* shows clothespins on initialed tape and the stripper, which has turned blue with use.
- Remove the plate after an hour or so to check on the stripping progress. Reinsert if film remains. In the *bottom photo*, the stripper has removed the film areas that printed black on a P.E.T.G. plate but thicker film areas remain.

- When no film remains on the plate, lift the plate from the stripper.
- Remove the handle from the back of the plate. If this is difficult, insert the plate in hot water or heat it for tape removal. Rubbing alcohol can remove any remaining adhesive.
- Rinse the plate in room-temperature water.
- Dry the plate with a clean paper towel.

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16. Drying the Print

Dry the print
Immediately after printing, place the wet print on a screenprinting drying rack (*top photo*) or dry the print under pressure. Prints that dry on the drying rack will need to be sprayed with water later and dried between blotters under boards with weights. Keith Howard has developed a drying system with an electrically run pulley that dries the prints flat.

Steps

- Raise the top of the drying system.
- Place a clean sheet of cardboard on one of the drying boards.
- Place a clean blotter on the cardboard.
- Place the wet print on the blotter (*second photo*).

- Place clean pellon on the print (*third photo*).

- Place a clean blotter on the pellon (*fourth photo*).

- Place a clean sheet of cardboard on the blotter (*fifth photo*).

- Close the drying system by pushing the button (*bottom*).

- Prints can be stacked. When another print is ready to be dried under pressure, remove the cardboard and place the new print on the previous top blotter. Add a new pellon and blotter before returning the cardboard and closing the drying system.

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17. Label and Touch-Up the Edition

Remove unwanted marks from the edition
Remove unwanted ink marks while still wet with a wet sponge. After the marks have dried, remove them with Scotch tape or, if that does not work, with an X-acto blade.

Materials
Touch-up requires: Scotch tape; an X-acto blade with a straight sharp edge; soft colored pencils, such as Pentel (or Prismacolor, which is slightly harder); and a bone burnisher, such as is used for matting artwork.

Steps to remove marks

- Press a small section of tape against a white cloth to remove some adhesive.
- Repeatedly press tape against the dried ink mark and lift. This is a slow process.
- If the tape does not work, hold a blade with the flat, sharp edge against the paper and drag it slowly to lift a small amount of paper. Do not jab with the blade.
- Burnish with a bone burnisher to flatten the paper.
- Fill in any undesired white spots with a colored pencil.

Label the edition
Intaglio-Type prints are labeled (or *signed off*) in the same manner as other intaglio prints. After prints have been thoroughly dried and flattened, label with a #2 pencil just below the print. They are labeled ¼ inch below the print and writing does not extend beyond either side of the bottom plate mark.

Materials
Labeling requires a sharpened #2 pencil.

Steps

- Lay out all the prints made with the same plate(s) and decide which should be included in the edition. Artists usually make 10% more than will be included in the edition.
- Title each print in the edition on the far left under the plate mark.
- Sign and date each print in the edition on the far right below the plate mark.
- In the center below the plate mark, write the print number (1, 2, etc.,), followed by a backslash, and then the total number of prints in the edition. For example, the print *opposite* is the best print in an edition of 5 so the print is labeled 1/5 in the center below the plate mark; other prints included in this edition are numbered 2/5, 3/5, 4/5 and 5/5. Prints with inconsistencies are labeled A.P. for *Artist's Proof* rather than given a number in the edition.

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18. Toner-Wash Preparation

Wash drawings painted and/or drawn on a transparent or translucent surface create image stencils with painterly, spontaneous mark-making imagery. An especially effective wash media is Toner-Wash, which uses exhausted toner from copy machines or laser printers. These toners are approximately 90% thermoplastics and 10% carbon black pigment (Source: Nik Semenoff). Exhausted toner is readily available for recycling in Toner-Wash.

Materials and equipment
Toner-Wash preparation requires: used toner powder as the pigment; Future Acrylic Floor Polish as the binder; rubbing alcohol as the drying agent; window cleaner, such as Windex and/or soapy water (approximately 10 drops of liquid dish detergent per cup of water) in a spray bottle as the wetting agent; spoon for toner; stirring spoon or spatula for mixing; small container for mixing the Toner-Wash, such as a 1-cup yogurt container; paint brush; scrap of 0.003 single-sided drafting Mylar; dust mask to avoid inhaling toner powder; work surface covered with newsprint for easy clean up.

Recipe

1 part Future
1 part toner powder (or 2 parts)
1 part rubbing alcohol
1 part Windex
1 part soapy water (10 drops dish detergent per cup of water)

Amounts are approximate and can be adjusted after testing the prepared Toner-Wash.
Note: some formulas include either Windex or soapy water but this recipe includes both.

Steps for Toner-Wash preparation

- Pour 1 teaspoon Future into a 1-cup container (*top photo*).
- Add 1 or 2 teaspoons toner powder (*second photo*). Stir well.
- Punch a hole in the lid of a bottle of rubbing alcohol. Pour 1 teaspoon alcohol into toner mixture (*third photo*). Stir well.
- Add 1 teaspoon Windex to toner mixture (*fourth photo*). Stir well.

- Add 1 teaspoon soapy water to toner mixture (*bottom photo*). Stir well.
- Brush the prepared Toner-Wash on the emulsion side (i.e., dull, matte side) of a scrap of 0.003 single-sided drafting Mylar and set it aside to dry.
- Examine the dried Toner-Wash for adjustments

  If the Toner-Wash wipes off the drafting Mylar easily - add more Future

  If the Toner-Wash has no blacks - add more toner powder.

  To increase reticulation - add Windex or alcohol.

  Note: Unused Toner-Wash can be stored in a closed container for a few days; stir well before using.

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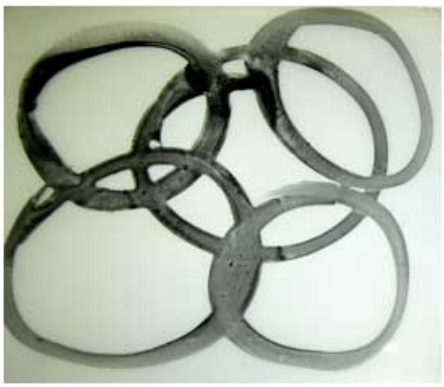
19. Wash-Drawing Intaglio-Type

Wash drawings on a transparent or translucent surface produce stencils with painterly, spontaneous mark-making imagery for use with ImagOn photopolymer.

Wash-Drawing media and substrates
Wash media need to block light effectively to produce blacks in the print. India inks and felt-tip markers lack opacity. Fluoro Masking Ink, acrylic paints, gouaches and tusches work. Exhausted toner from copy machines or laser printers makes the most opaque toner-wash and can be diluted for a broad tonal range.
Substrates should permit controlled dispersal of the wash media without buckling. Mylar and acetate do not permit

controlled dispersal; vellum and paper buckle. Work on the dull, roughened surface of single-sided 0.003 drafting Mylar, frosted Lexan, Artex Textured Film, Grafix Textured Film or Hewlett Packard's inkjet transparency.

Materials and equipment
Toner-Wash-Drawing requires: prepared Toner-Wash; spoon or spatula; paint brush and other mark-making tools; single-sided 0.003 drafting Mylar or other substrate; sharp blade; rubbing alcohol with a hole in the bottle's lid; Windex in a spray bottle; small container of water; laminated ImagOn plate; aquatint screen.



Steps

- Cut a section of single-sided 0.003 drafting Mylar and position with the emulsion side (i.e., matte, dull side) facing up.
- Draw and/or paint Toner-Wash onto Mylar. Apply the Toner-Wash diluted or undiluted.
- Spray Windex lightly on the drafting Mylar to increase reticulation, if desired.
- Pour a few drops of rubbing alcohol over the surface for a starburst effect, if desired.
- Set the drafting Mylar aside to dry (*top, opposite*).
- Remove any unwanted marks by scraping with the blade or dissolve with soda ash solution.
- Make an ImagOn test plate to determine the best exposure.
- Make a standard aquatint screen exposure. Remove the aquatint screen.
- Make an image exposure with the Toner-Wash-Drawing positioned emulsion-to-emulsion on the ImagOn plate (*bottom, opposite*).
- Follow standard procedures for developing, inking and printing the plate.

Toner-Wash-Drawing Intaglio-Type using Windex spray
The materials and steps are the same as for the previous Wash-Drawing Intaglio-Type.

- Cut a section of single-sided 0.003 drafting Mylar and position with the emulsion side (i.e., matte, dull side) facing up.
- Draw and/or paint Toner-Wash onto the drafting Mylar. Apply the Toner-Wash diluted or undiluted.
- Spray Windex lightly on the still-wet drafting Mylar to increase reticulation, (*top, opposite).*
- Set aside to dry. The *bottom photo* (*opposite*) is the dry drafting Mylar.
- Make a standard aquatint screen exposure.
- Make an image exposure with the Toner-Wash-Drawing.
- Follow standard procedures for developing, inking and printing the plate.

Toner-Wash-Drawing Intaglio-Type with rubbing alcohol addition
The materials and steps are the same as for the two previous examples of Wash-Drawing Intaglio-Type.

- Cut a section of single-sided 0.003 drafting Mylar and position with the emulsion side (i.e., matte, dull side) facing up.
- Draw and/or paint Toner-Wash onto the drafting Mylar. Apply the Toner-Wash diluted or undiluted.
- Pour a few drops of rubbing alcohol on the still-wet drafting Mylar for a starburst effect. The *top photo* (*opposite*) shows rubbing alcohol being poured from a hole in the lid of the alcohol bottle.
- Set aside to dry. The *bottom photo* (*opposite*) is the drafting Mylar after it has dried.
- Make a standard aquatint screen exposure.
- Make an image exposure with the Toner-Wash-Drawing based on the results of a step-test.
- Follow standard procedures for developing, inking and printing the plate.

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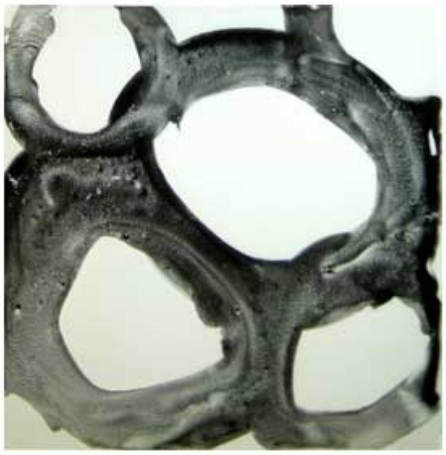
20. Direct Intaglio-Type

Direct Intaglio-Type is Wash-Drawing Intaglio-Type with the Toner-Wash applied directly onto the protective Mylar of ImagOn film after an aquatint screen exposure. In Direct Intaglio-Type, the image stencil is in closer contact with the film than when a separate substrate is employed for the Toner-Wash.

Materials and equipment
Direct Intaglio-Type requires: prepared Toner-Wash; spoon or spatula; paint brush and other mark-making tools; rubbing alcohol with a hole in the bottle's lid; Windex in a spray bottle; small container of water; prepared ImagOn plate; aquatint screen; standard materials and equipment for exposing, developing and printing a plate.

Steps

- Make a standard aquatint screen exposure with a prepared ImagOn plate.
- Working away from direct sunlight, draw and/or paint Toner-Wash directly onto the ImagOn Mylar (*top photo*). Apply the Toner-Wash diluted or undiluted, as desired.
- Spray Windex lightly on the drafting Mylar to increase reticulation, if desired.
- Pour a small amount of alcohol over the surface for a starburst effect, if desired.
- Set the plate aside to dry in a cool, dark location for approximately 30 minutes.
- When the plate is dry, make an exposure of the Toner-Wash-Drawing using the light units determined by prior experience with Toner-Wash-Drawings.
- Remove the protective Mylar and set it aside (The *bottom photo* is the protective Mylar with the completed Toner-Wash-Drawing after removal from the ImagOn film.).
- Immediately insert the plate in the developer.
- After 9 minutes, rinse, spray with vinegar and rub it in, rinse, pat dry and heat dry the plate. Leave the plate overnight.
- The plate is ready to ink and print according to standard procedures.



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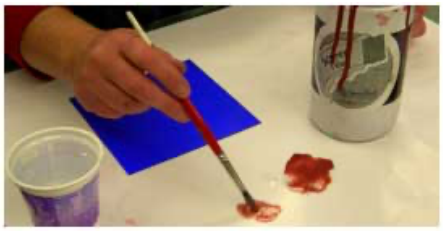
Intaglio Type

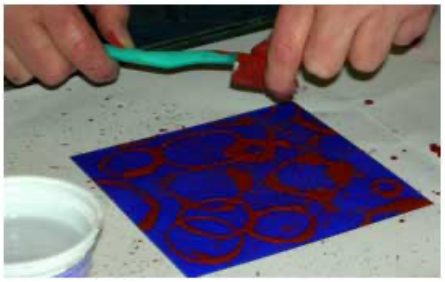
21. Mezzo-Type



Mezzotint (from the Italian *mezzatinta*, halftone) is a traditional intaglio method for working from blacks to whites. First, a spiked tool is rocked in all directions over the metal plate to produce an all-over pitting which prints velvety black; then areas of the surface are scraped and burnished to produce modulated tones from grays to white with the velvety black. Mezzotint is the most laborious intaglio process. The same effect is achieved quickly and easily with Mezzo-Type, an Intaglio-Type process that begins with a dry, aquatinted and developed ImagOn plate. Various dilutions of screenfiller are painted on the dry plate to produce the complete tonal range - the thicker the screenfiller application, the whiter the tone. Mezzo-Type can also be used as a reworking technique to introduce whites into dark areas.

Materials and equipment
Mezzo-Type requires: dry ImagOn plate exposed with an aquatint screen and developed; Speedball screenfiller or other liquid acrylic; small container of water; brushes and painting tools.

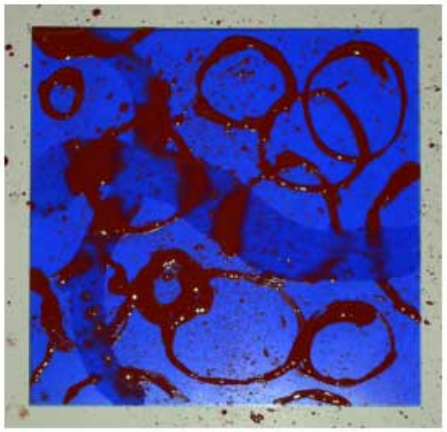
Additive Mezzo-Type
Apply screenfiller to a plate after exposing with an aquatint-screen and developing.



Steps

- Begin with a dry ImagOn plate that has been exposed with an aquatint screen and been through the complete development process and left overnight to harden. At this point, the plate would print a velvety black.
- Mix dilutions of screen filler in small containers, on a palette, or on the work surface (*top photo*).
- Apply screenfiller straight or diluted to the plate -- undiluted for white, more and more diluted for darker and darker grays. Charge the brush with water to further dilute the screenfiller or paint water on the plate to produce a wash effect.

- Various tools can be used to apply screenfiller besides brushes. In the *second photo*, screenfiller is applied with an eye dropper. In the *third photo*, undiluted screen filler is flicked from a toothbrush onto the plate.

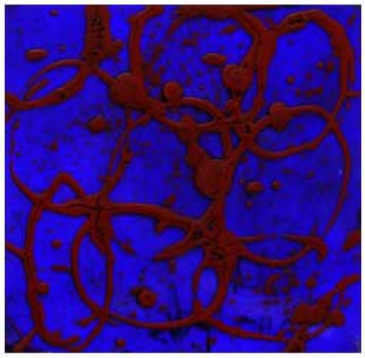


- The bright cross on the left of the plate in the *bottom photo* is a still-wet thin wash of very dilute screenfiller applied with a brush. The thick circles were made with an eye dropper and the small dots with flicks of a toothbrush.
- Set the plate aside overnight to dry. Dry the screenfiller completely before inking and printing. If the screenfiller is thick, reduce the pressure on the press slightly for printing.

Embossing with Additive Mezzo-Type
Additive Mezzo-Type embosses the print - a quality that permits creating a non-inked image characterized by white-on-white embossing. The heavier the application of screenfiller, the deeper is the embossing.

Materials and equipment
Embossing Mezzo-Type requires: dry ImagOn plate exposed with an aquatint screen and developed; Speedball screenfiller; brushes and painting tools.

Steps



- Apply screenfiller to the plate with a brush and/or eye dropper.
- Heat dry. Set the plate aside to harden.
- Do not ink the plate.
- Place the plate on the press, cover with damp printing stock, and run through the press.
- Dry the plate without pressure.

Note: The plate can be inked for printing after all embossed images are produced. Once the plate is inked, it cannot be used for purely embossed images since a small amount of ink remains on the plate after cleaning and this ink would transfer during embossing.

The photo (*right*) is the plate for white-on-white embossing made with multiple applications of screenfiller.

Additive Wet-on-Wet Mezzo-Type
Screenfiller is water-soluble when wet and waterproof after it dries; screenfiller dries from the edges inward. These two qualities permit the creation of double lines. Paint screenfiller with a brush or eye dropper and rinse it off after the edges dry. The sooner screenfiller is rinsed off after the edges dry, the finer the line. Entire images can be built up in this way.

Steps

- Begin with a dry ImagOn plate that has been exposed with an aquatint screen, and left overnight to harden. At this point, the plate would print a velvety black.
- Apply undiluted screenfiller with a brush or eye dropper or flick it onto the plate.
- When edges appear dry, rinse the plate with cool water.
- Pat dry, heat dry, and rework as desired.
- Pat dry. Heat dry. Set the plate aside overnight to dry. Dry the screenfiller completely dry before inking and printing. If the screenfiller is thick, reduce the pressure on the press slightly for printing.

States for an Additive Wet-on-Wet Mezzo-Type
The *top photo* is the first state for a print using Additive Wet-on-Wet Mezzo-Type as the main technique. First the edges of the plate were broken up with spit-bite. Then a wash of very dilute screenfiller was applied. Screenfiller was applied with an eye dropper. When the edges of the lines dried, the plate was rinsed and dried.

The *second photo* shows the second state for the print. More screenfiller applications with an eye dropper were rinsed after the edges dried. The plate was dried again.

The *third photo* shows the third state for the print. Spit-bite was applied to break up the edges. More screenfiller applications with an eye dropper were rinsed after the edges began to dry to increase the complexity of the line imagery.

Reductive Mezzo-Type
In reductive Mezzo-Type, the aquatinted emulsion is worn down with snake slip or wet-dry sandpaper used dry. Worn down emulsion prints lighter tones.

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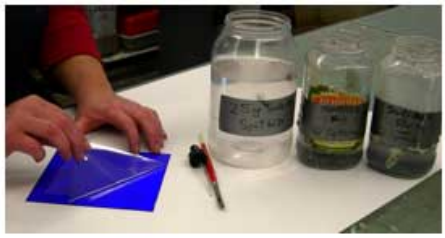
Intaglio Type

22. Spit-bite Intaglio-Type

In traditional intaglio, spit-bite is a technique for hand-developing areas on an etched plate; the etching solution is mixed with spit, soap, or Gum Arabic and painted onto areas of the plate for an irregular, soft, wash-like appearance in the print. Spit-bite Intaglio-type is a hand-developing technique that permits spontaneous drawings and/or wash-like effects on an ImagOn plate with various concentrations of soda ash developer.

Materials and equipment

Spit-bite Intaglio-Type requires: 3 lidded, 1-liter glass containers labeled mild, medium, and strong, respectively; balance scale; soda ash; stirring device; laminated ImagOn plate; painting and drawing tools; water in a small container; vinegar in a spray bottle or tray; paper towels.



Spit-bite developer concentrations
Mild solution: 10 grams soda ash per liter of water.
Medium solution: 25 grams soda ash per liter of water.
Strong solution: 50 grams soda ash per liter of water.

Steps

- Add ½ liter hot water to each container. Measure the soda ash for each concentration and add to the respective containers. Stir until the soda ash dissolves. Add water to bring the solutions to 1 liter. Cover and set aside overnight.
- Expose a laminated ImagOn plate with the standard aquatint screen exposure.
- Remove the protective Mylar (*top photo*).
- Selectively hand develop the plate: paint or draw with the mild spit-bite concentration, then the medium, and lastly the strong concentration (*second photo*). Work on a dry plate or charge the brush with water to make a wash effect.
- To avoid eroding ImagOn-Rapid film, do not exceed: 8 minutes for the mild solution, 4 minutes for the medium, and 2 minutes for the strong solution. ImagOn-PRO is 1.5 times thicker so the spit-bite can remain almost twice as long.
- Rinse the plate with cool tap water (*third photo*).
- Spray with vinegar (*fourth photo*). Rinse. Pat dry with a paper towel (*bottom photo*). Heat dry.
- Leave the plate in the sun for 30 minutes or expose it in the platemaker for the same amount of time as a standard aquatint exposure. Set aside overnight before inking and printing.
- If areas print too light, rework the plate with more spit-bite solution in the same manner.

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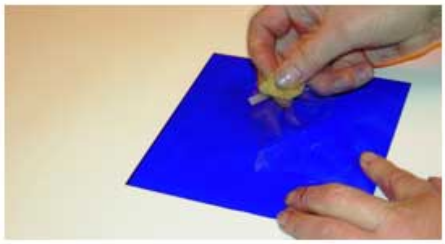
Intaglio Type

23. Stencil Intaglio-Type

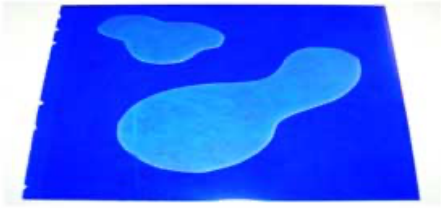
Stencil Intaglio-Type combines techniques used in Mezzo Intaglio-Type and Spit-bite Intaglio-Type. Part of the Mylar remains in place for tray-development, which produces rich black shapes; the rest of the Mylar is removed for hand-developing with spit-bite to produce dark tones and applying screenfiller to produce light tones.

Materials and equipment
Stencil Intaglio-Type requires: laminated ImagOn plate; dry-erase marker; sharp knife with snap-off blades; packing tape; mild, medium and strong spit-bite concentrations; painting and drawing tools; vinegar in a spray bottle or tray; paper towels; Speedball screenfiller; small container of water.

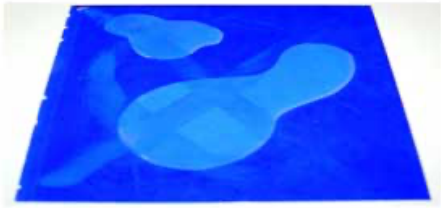


Steps

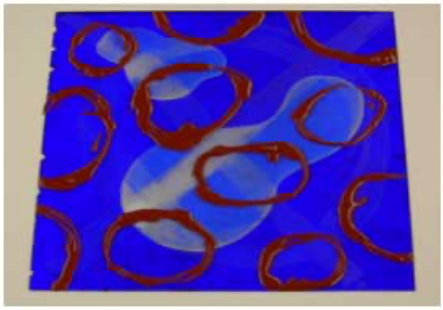
- Make a standard aquatint screen exposure with a prepared ImagOn plate. Do not remove the Mylar!
- On the Mylar, mark shapes for removal (optional). Cut shapes in the Mylar for removal (*top photo*); do not cut through the emulsion.
- Oxygen affects emulsion. Remove the cut Mylar shapes only after all are cut. Lift the cut Mylar shapes with a small piece of packing tape (*second photo*). Leave the remaining Mylar in place.



- Immediately tray develop the plate; areas with Mylar in place will not develop. Rinse; apply vinegar; rinse; pat dry; heat dry. The *third photo* is the developed plate.



- Remove the remaining Mylar. Apply spit-bite, working from mild to strong. Protect developed shapes from open bite with Vaseline, if desired. The *fourth photo* is the plate with spit-bite.



- Spit-bite dissolves screenfiller so complete spit-biting before applying screenfiller. To integrate the rich black areas with the white, consider outlining the cut stencils with screenfiller or softening their edges with spit-bite. The *bottom photo* is the plate with screenfiller applied.

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Intaglio Type

24. Pastel Intaglio-Type

Create an effective stencil for ImagOn with black pastel or charcoal worked wet-on-wet and dry-on-wet on 0.003 drafting Mylar (or other transparent or translucent substrate).

Materials and equipment
Pastel Intaglio-Type requires: charcoal or black pastel, such as Alphacolor Char-Kole, a rich black pastel stick; 0.003 drafting Mylar (or other suitable wash-drawing substrate); sponge; vinyl eraser; kneaded eraser; paper towels; small container of water; aquatint screen; laminated ImagOn plate.

Steps

- Cut a section of single-sided 0.003 drafting Mylar and position with the emulsion side (i.e., matte, dull side) facing up.
- Sponge water on the drafting Mylar.
- Begin drawing with the black pastel on the drafting Mylar (*top photo*).
- Work back and forth, wet and dry: create a wash in areas by dropping water from a sponge onto the drawing; create lighter tones by rubbing with a sponge, kneaded eraser, vinyl eraser (*second photo*) or paper towel; create darker tones by drawing back in with charcoal.

- Set the drawing aside to dry if it is still wet. The *third photo* is the completed pastel drawing.
- Make an ImagOn test plate to determine the best exposure.
- Make a standard aquatint screen exposure. Remove the aquatint screen.

- Place the drafting Mylar emulsion-to-emulsion on the ImagOn plate. Make an image exposure for the pastel drawing (*bottom photo*).
- Follow standard procedures for developing, inking and printing the plate.

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Intaglio Type

25. Line Intaglio-Type

Line drawings can become image stencils for non-etch Intaglio-Type. Graphite works well, but any drawing medium with opacity to UV light can be used; this is an area open to experimentation. Single-sided drafting Mylar is a substrate that accepts graphite without a long image exposure; tracing paper and double-sided Mylar work as substrates but these substrates require a longer exposure. Lines less than 1/8 inch thick do not require an aquatint exposure prior to image exposure. Line drawings with solid areas require an aquatint exposure to avoid open biting.

Materials and equipment
Line Intaglio-type requires: 2B and 4B graphite; single-sided 0.003 drafting Mylar; two laminated ImagOn plates (one for testing); standard developing, inking and printing supplies.

Steps

- Make a line drawing with 2B and 4B graphite on single-sided .003 drafting Mylar.
- Make a step-test of image exposure with one laminated plate.
- Develop, ink, and print the step-test in the standard manner. Determine the best quantity of light units.
- Make an image exposure of the remaining laminated ImagOn plate with the line drawing emulsion-to-emulsion.
- Tray develop the plate. Rinse. Spray vinegar. Rinse. Pat dry with a paper towel. Heat dry, sun dry, and/or expose on the platemaker for the quantity of light units required for a standard aquatint exposure. Set aside overnight before printing the plate.

The photo shows a print made with graphite line drawing on single-sided 0.003 drafting Mylar as it comes off the press.

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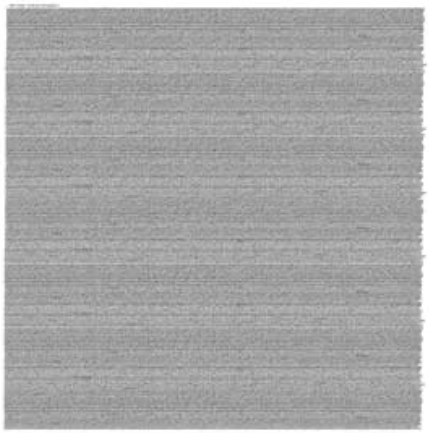
Intaglio Type

26. Text-Stencil Intaglio-Type



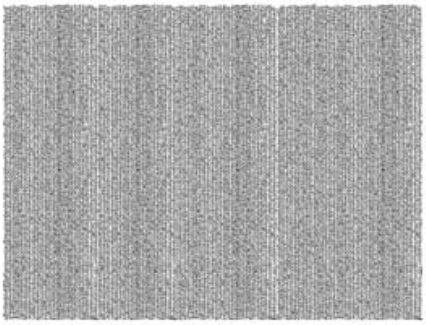
An image stencil can be created entirely of text, intended to be read or to function as texture. Text finer than 1/8th inch does not require an aquatint screen exposure prior to the image exposure. Leading appears between rows of text in Microsoft Word, but Photoshop has more flexibility.

Materials and equipment
Text Stencil Intaglio-Type requires: text-writing program, such as Microsoft Word or Photoshop; transparency; inkjet printer; two laminated ImagOn plates (one for a step-test); standard developing, inking and printing supplies.

Steps for creating a text stencil without leading

- Open Photoshop (or other photo-manipulation software). Make a new file the size and resolution desired with a White background. Save as a tiff file.
- Select the Text Tool in the Toolbox. Choose a color and font for the text. The font for the text in the examples here was Black Arial Font 12, which does not require an aquatint screen exposure because it is finer than 1/8th inch.
- Type a line of text. Leave the Text Tool; flatten the image.
- Return to the Text Tool. Write a line of text. Select the Move Tool. Move the text close to the previous line. Flatten the image: Layers, Flatten Image. Save.
- Continue writing with the Text Tool, moving the text, flattening the image, and saving the file until the image is completed.
- Do not change the levels on the image if using Black font. Print on a transparency with an inkjet printer.
- Make a step-test plate with a laminated ImagOn plate to determine the best image exposure. Text generally requires a slightly longer exposure than an aquatint screen. Based on the step-test, make an image exposure of the text.

The photo at the *top right* is a 24 x 24 inch storyboard stencil with no leading, Black Arial Font 12, without spacing between words or punctuation. It was used to create the 18 x 24 inch 4-color texturized abstraction print shown in the *middle* photo, *Storyboard 1A: Childhood*.



The *bottom* photo shows an 18 x 24 inch storyboard stencil with no leading, spacing or punctuation in Black Arial Font 12. Its horizontal format saves space for printing the transparency.

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Intaglio Type

27. Photo Intaglio-Type

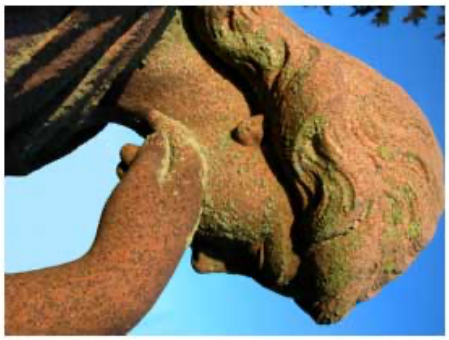

Photo Intaglio-Type is a non-etch technique for producing photographic quality continuous-tone imagery with an aquatint screen exposure followed by an image exposure with a photo transparency stencil.

Materials and equipment
Photo Intaglio-Type requires: two laminated ImagOn plates (one for a step test and the other for the print); aquatint screen; black-and-white continuous-tone photograph (or a CMYK photograph converted to black-and-white); Photoshop or other image-manipulation software; inkjet or photocopy transparency; Rubylith or opaque card for the step-test; standard developing, inking and printing materials.

Steps

- Begin with a continuous-tone black-and-white or CMYK photograph, such as the digital image in the *top photo*. If the image is digital, open it with Photoshop (or other photo-manipulation software) and change the Mode to Grayscale. Otherwise, scan the image and import it into Photoshop.
- In Photoshop, adjust the image as desired. The image in the *bottom photo* is derived from the CMYK image in the *top photo*. The image was cropped and the sliders below the histogram in Levels were moved to include black and white tones.
- Option 1: photocopy the black-and-white photo with opaque black ink on a photocopy transparency; be sure the image is dense enough.
- Option 2: print the manipulated image on an inkjet transparency with an inkjet printer.
- Make a standard aquatint screen exposure on the laminated ImagOn test plate.
- Make a step-test image exposure with the transparency positioned emulsion-to-emulsion on the test plate. Develop and print to determine the best image exposure.
- Make a standard aquatint screen exposure on the second laminated ImagOn plate.
- Make the image exposure with the transparency positioned emulsion-to-emulsion on the plate.
- Tray develop in the standard manner. Rinse, spray with vinegar, rinse, dry, heat dry. Expose the plate without a stencil for the same quantity of UV light as the aquatint screen exposure. Set the plate aside overnight.
- Ink and print the plate.

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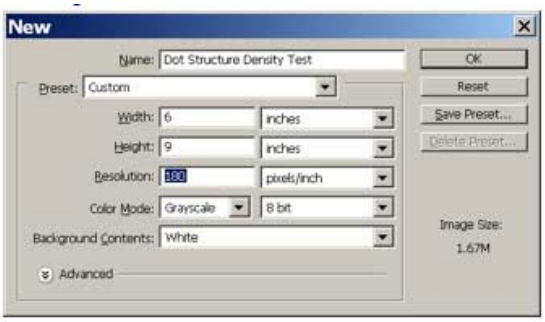
Intaglio Type

28. Digital-Halftone Intaglio-Type

Monotone Photo Intaglio-Type is a non-etch technique for producing photographic quality continuous-tone imagery without the necessity of an aquatint screen exposure. If blacks in the photo stencil are denser than 80% random dot structure, the blacks drop out in the developed ImagOn plate and produce whites in the print. Aquatinting in traditional etching or an aquatint screen exposure in non-etch intaglio-type break up the solid areas, which avoids open biting.
Photographs can be manipulated in Photoshop (or other image-manipulation software) to open solid blacks to 80%. Inkjet printers produce a random dot structure. These two qualities permit image exposures without the necessity of an aquatint screen exposure.
The easiest way to determine the necessary Photoshop manipulations for digital halftone photo stencils is to make a dot structure step-test for the transparency and printer. The step-test needs to be performed once to determine the best density of black for each transparency and printer combination.

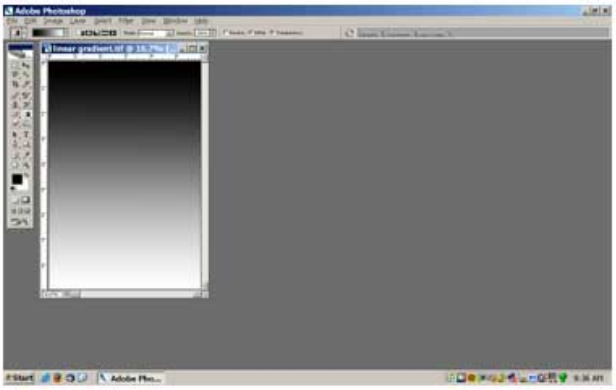
Dot Structure Density Test

Materials and equipment
The step-test requires: Photoshop (or other image-manipulation software); the transparency that will be used for the photo stencil, such as Azon 787N clear graphic film; the inkjet printer that will be used for the photo stencil - it should be able to print opaque blacks without mixing black with colored inks, such as the Epson 7600 or Epson 3000; loupes OR laminated ImagOn plate and standard developing, inking and printing materials and equipment

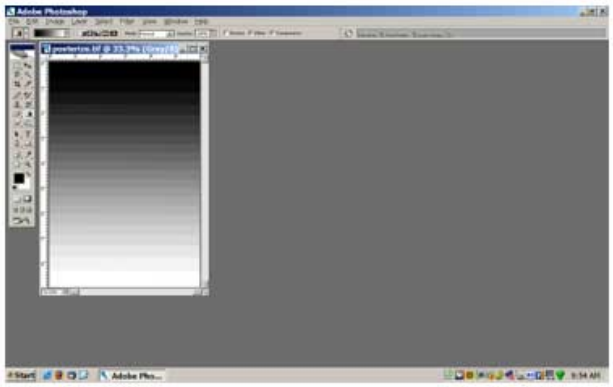


Steps for the making the step-test transparency

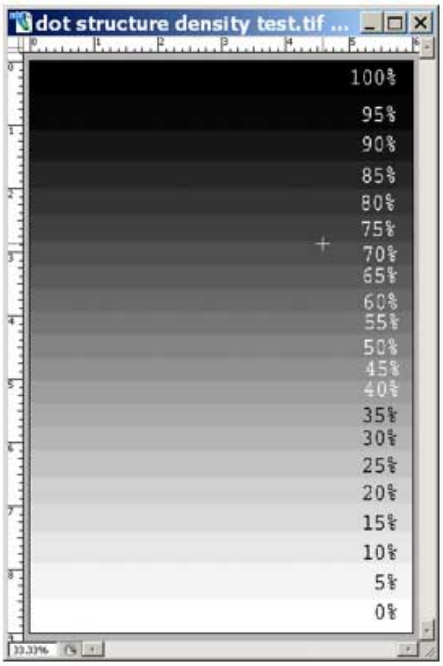
- In Photoshop, make a new file and name it density test: File, New
- This brings up the menu shown in the figure *top right*. Name the file and complete the options as shown in the menu. The dimensions shown here assume a transparency size 8½ x 11 inches.
- Make sure the foreground and background colors at the bottom of the Toolbox are the default: black foreground and white background.
- In the Command Menu, click on Select. This brings up a drop-down Menu; click All.
- Select the Gradient Tool in the Toolbox and the Linear Gradient in the Options Bar. Draw a straight line from the top to the bottom. This produces the gradient shown in the figure *opposite*.



- In the Command Menu, select Image. This brings up a drop-down Menu; select Posterize, which brings up a pop-up menu. Change the Levels to 21. This produces the distinct gradients shown in the figure *opposite*.
- In the Command Bar, choose Select. This brings up a drop-down menu; click on Deselect.
- In the Toolbox, select Text.
- Label each distinct gradient, from 100% at the top bar to 0% at the bottom bar. The file should now look like the *second figure*. Note that the text is in white for the dark tones and black for the light tones to facilitate easy reading.
- Save the file.



- Print the dot structure density test on the emulsion side of the transparency with the inkjet printer you plan to use for photo stencils. Set the printer to best quality, Black. If the printer has the option, print with two cartridges of matte black ink. To print AZON 787N Clear Graphic Film in the Epson PRO 7600 Inkjet Printer: Select the printer and film size; in Print Settings, select Black, Adhesive Vinyl, Advanced (uncheck all boxes), 720 dpi.



Option 1:

- Examine the transparency with loupes to determine where the dot structure is 80% random black dots (*bottom photo*).

- When manipulating photos in Photoshop, plan to move either the Levels or Curves to change 100% black to the percentage that produces the 80% random black dots; OR

Option 2:

- Position the transparency on the laminated ImagOn plate emulsion-to-emulsion at the platemaker.
- Expose the transparency with the light units required for the standard aquatint screen exposure.
- Develop and print the plate.
- Examine the print for the blackest black; this could be anywhere from 85% to 55%. The blackest black is the 80% random dot structure. In Photoshop, move either the Levels or Curves to change 100% black to the percentage that produces the blackest black for the transparency and printer combination.

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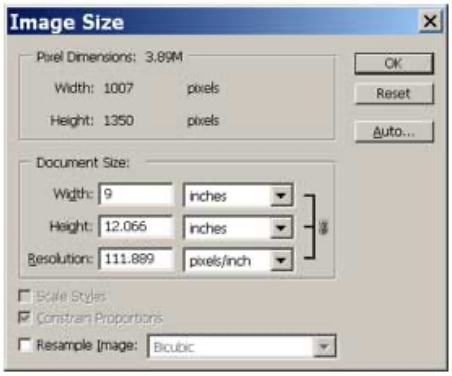
Intaglio Type

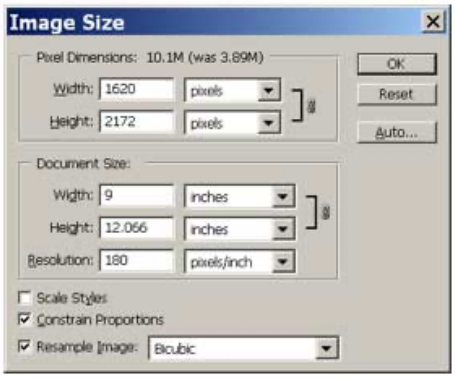
29. Digital-Halftone Intaglio-Type for Monotone Photo Stencils



An aquatint screen exposure prior to an image exposure with a photo stencil produces a continuous-tone non-etch intaglio-type monotone print. To avoid the necessity of an aquatint exposure, manipulate the photo stencil in Photoshop to create a digital halftone for a non-etch intaglio-type monotone print. Before manipulating the photo, determine the density for the transparency and inkjet printer that opens up 100% blacks to an 80% random dot structure by making the Dot Structure Density Test.

Manipulate the Image in Photoshop

Materials and equipment
Manipulating the image requires: film or digital photograph; Photoshop (or other image-manipulation software); transparency, such as Azon 787N Clear Graphic Film; and an inkjet printer, such as Epson PRO 7600.



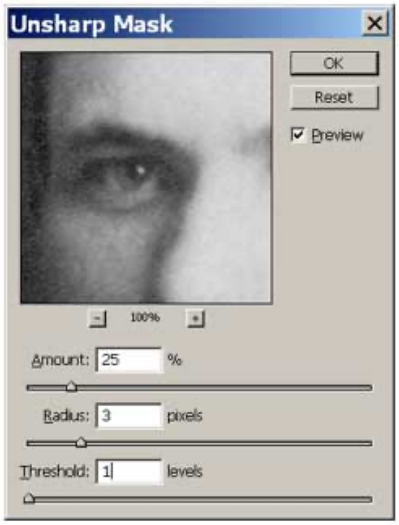
Steps

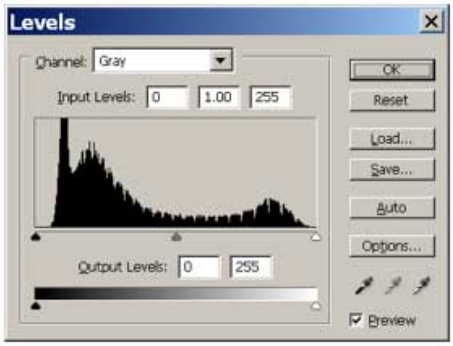
- Open the original photo file and save as a new tiff file in a new folder to preserve the original file. Work only with the duplicate file.
- Change the size to fit the transparency: Image, Image Size, uncheck Resample Image, as in the *top right figure*. Fill in the inches. Click OK.
- Change the resolution so it is at least 1/4th the printer output, 720 on the Epson PRO 7600 (some say 1/6th or 120): Image, Image Size. Check Resample Image, Bicubic, and Constrain Proportions, as in the s*econd figure, right*. Change the resolution in steps, as 111.889 to 150 dpi and then 180 dpi. Save as a new file.
- Crop the image if it improves the image or if needed to fit the transparency: Select with a Marquee Tool; then Image, Crop.
- Straighten any angled lines: Select, All; Edit, Transform, Skew.
- Straighten the image if needed: Image, Rotate, Arbitrary, and then fill in degrees and CW or CCW.
- Change the Mode to black-and-white: Image, Mode, Grayscale. Save as a new tiff file.
- Improve the contrast: Image, Adjustments, Levels. Move the sliders as needed to get black and white. In the *bottom figure*, the black slider below the histogram would be moved to the right. Save as a new tiff file.
- Magnify the image with the Zoom Tool in the Toolbox to remove defects with the Clone Tool or Band-aid Tool. Save as a new tiff file.

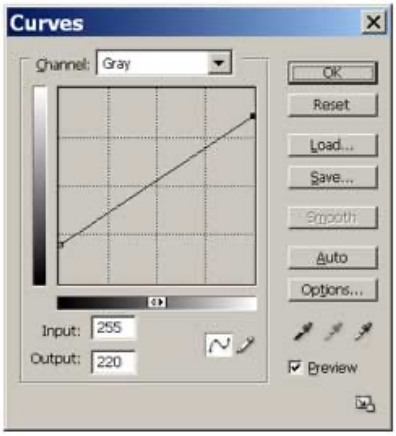
- If the image was scanned, sharpen the image in increments; do not sharpen digital camera images. To

sharpen: Filter, Sharpen, Unsharp Mask, check Preview so you can see the effect. Use 25-50%, 1-3 Radius, 0-2 Threshold, as shown in the *figure opposite*. Save as a new tiff file. If needed, repeat these steps and save as another new tiff file and add "fixed" to the title.

- Use the Zoom Tool to return the image to a size that fits the screen.







Prepare the Digital-Halftone Stencil

After performing the dot structure density test for the printer and transparency and determining the percentage with the blackest black, the image will need to be adjusted accordingly.

Steps

- The easiest way to lower the density of blacks is in Curves: Image, Adjustments, Curves; then drag the black diagonal to the percentage determined by the dot structure density test. In the *second figure, right*, the diagonal was moved to 80% since the best black printed at 80% for Azon 787N Clear Graphic Film in an Epson PRO 7600 Printer. In my experience, the light tones drop out also, so the diagonal is also moved to 15% to leave some dots in the whitest whites.
- Save the file with the title "ready".
- Set the printer to best quality, Black. If the printer has the option, print with two cartridges of matte black ink. To print AZON 787N Clear Graphic Film in the Epson PRO 7600 Inkjet Printer: Select the printer and film size; in Print Settings, select Black, Adhesive Vinyl, Advanced (uncheck all boxes), 720 dpi.
- Print on the emulsion side of the transparency. Be careful handling the transparency to avoid fingerprints that could block light.

The digital-halftone transparency is now ready to be used in the standard manner for image exposure without an aquatint screen exposure to produce a monotone image.

Example
The example used throughout this topic began with a scan of a small portrait taken in the early 1900s (*top left*).

The photo was manipulated in Photoshop to enhance it, as described in this topic (*bottom left*).

To enhance the aged effect, the photo was cropped to an oval.

Finally, the photo was adjusted in Curves to prepare it for printing onto Azon 787N Clear Graphic Film with an Epson PRO 7600 inkjet printer (*immediate left*).

Note that the contrast is reduced when Curves are changed to 80% and 15%.

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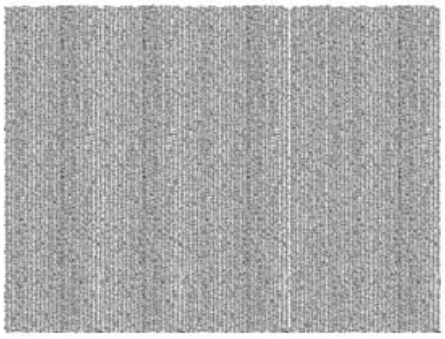
Intaglio Type

30. Layered Intaglio-Type

Layers of ImagOn can be laminated to a single plate after exposure. Standard tray development affects only the top layer. Hand development with spit-bite over-develops the top layer, which reveals the lower layer in selected areas. Dark tonal areas of ImagOn are thinner than light tonal areas so dark tonal areas respond more readily to spit-bite treatment to reveal the lower layer.



Materials and equipment
Layered Intaglio-Type requires: laminated ImagOn plate; a piece of ImagOn taped with transparent tape to a second plate of the same size; image stencils and/or aquatint screen; standard materials and equipment for developing, spit-biting, inking and printing.

Steps

- When working with layers, note which edge is the top of the image on each plate at all times so the plates are layered as planned.
- The print was produced by exposing a laminated ImagOn plate with the text stencil in the *top photo*; Arial Font 12 does not require an aquatint screen exposure since the font is smaller than 1/8 inch.
- For the print, the taped plate was exposed with the photo stencil (*right*), which was previously manipulated in Photoshop (Curves 80% and 15%) to avoid an aquatint screen exposure; the photo was printed on an Azon 787N transparency with an Epson 7600 inkjet printer. The two plates required different amounts of UV light.
- After both plates are exposed, remove the Mylar from the laminated ImagOn plate. Remove the protective backing from the taped ImagOn plate.
- Spray water on the exposed film of both plates.
- Position the loose film on the laminated plate with the Mylar side facing up.
- Squeegee the top layer of film. Rub with a cloth.
- Run the layered plate through the press to facilitate bonding.
- Tray develop the plate in the standard manner. Rinse; spray vinegar; rinse; dry the plate.
- Apply spit-bite solution to the top layer wherever the lower layer should show through.
- Rub the spit-bite areas with a sponge to facilitate removal of the top layer. Rinse; spray with vinegar; rinse; dry.
- Make a proof print. The *bottom photo* shows the plate after the first application of spit-bite.
- If not enough of the lower image is visible, apply more spit-bite. Note: it takes longer for spit-bite to eat through light tonal areas than dark tones.

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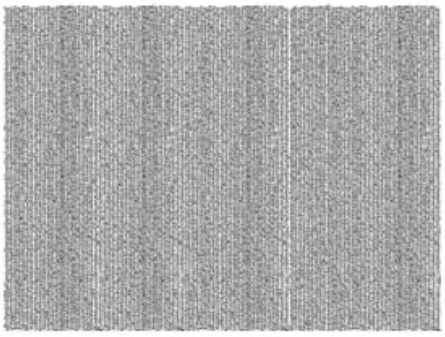
Intaglio Type

31. Wrinkled Intaglio-Type

Wrinkled Intaglio-Type is a variation on Layered Intaglio-Type. ImagOn is laminated to one plate and another piece of ImagOn is taped to a separate plate for exposure. After exposure of both plates, the taped plate is wrinkled over the laminated ImagOn plate prior to standard tray development. Hand development with spit-bite may be used to reveal more areas of the lower image, if desired.

Materials and equipment
Wrinkled Intaglio-Type requires: laminated ImagOn plate; a piece of ImagOn taped with transparent tape to a second plate of the same size; image stencils; standard materials and equipment for developing, inking and printing. Optional materials include an aquatint screen spit-bite solutions; brush for applying spit-bite.



Steps
When working with layers, note which edge is the top of the image on each plate at all times so the plates are layered as planned.

- For the print the laminated plate was exposed with the photo stencil (*above right*), which was previously manipulated in Photoshop (Curves 80% and 15%) and printed on an Azon 787N transparency with an Epson 7600 inkjet printer to avoid an aquatint screen exposure.
- The taped plate was exposed with the text stencil in the *second photo*; Arial Font 12 does not require an aquatint screen exposure since the font is smaller than 1/8 inch. The two plates required different amounts of UV light.
- After both plates are exposed, remove the Mylar from the laminated ImagOn plate. Remove the Mylar and the protective backing from the taped ImagOn plate.
- Spray water on the top of the laminated plate and the underside of the taped plate.
- Tear and wrinkle the loose film onto the laminated plate. Flatten the wrinkled film.
- Cover the wrinkled plate with Mylar.
- Run the wrinkled plate through the press to facilitate bonding. The *bottom photo* is the wrinkled plate after being run through the press.
- Tray develop the wrinkled plate in the standard manner. Rinse; spray vinegar; rinse; dry the plate.
- Optionally, apply spit-bite solution to the wrinkled layer to reveal more of the lower image.

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Intaglio Type

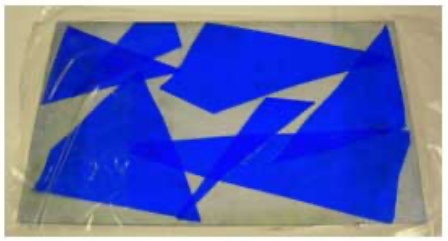
32. Construction Intaglio-Type

For Construction Intaglio-Type, individual pieces of ImagOn are laminated to a prepared plate. The Mylar layer for each piece is usually removed before laminating another piece of ImagOn to the plate; if the Mylar remains in place, the developer will not reach that piece of film so it will remain white. An entire image could be constructed so that only the black outlines of the pieces print. Construction Intaglio-Type can be combined with many other Intaglio-Type techniques.

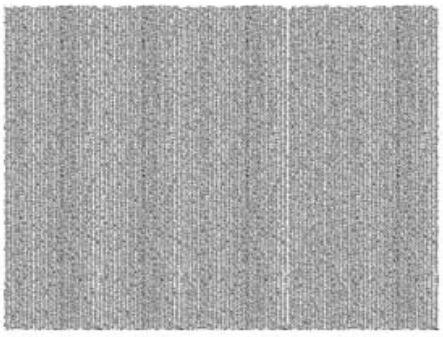
Construction Intaglio-Type with Text Stencils
Typed or handwritten text stencils can create effective imagery for Construction Intaglio-Type.

Materials and equipment
Construction Intaglio-Type with text stencils requires: a prepared plate; ImagOn; cutter with sharp blade; scissors; text stencil; standard tray developing materials and equipment.

Steps



- Begin by cutting a few pieces of ImagOn and removing their protective layers.
- Laminate the pieces to the plate individually with a squeegee. The *top photo* shows a couple of pieces laminated to the prepared plate.
- Remove the Mylar from the laminated pieces before overlaying more ImagOn pieces to the plate (*second photo*).
- Continue overlaying as desired, laminating each piece with a squeegee and removing the Mylar. It is not necessary to cover the entire plate with pieces.
- After all pieces have been layered, cover the plate completely with a reserved Mylar at least as large as the plate (*third photo*).
- Run the plate through the press to facilitate bonding. Leave the plate overnight.
- Expose the pieced plate with a text stencil. The text stencil used here is Arial Font 12; the lines are finer than 1/8 inch so an aquatint screen exposure is not needed prior to the image exposure with this text stencil (*bottom photo*).
- Tray develop the exposed plate in the standard manner. Rinse; spray with vinegar; rinse; dry; heat dry. Expose the plate without a stencil for the same amount of time as an aquatint screen exposure. Set the plate aside overnight before printing.



Construction Intaglio-Type with Photo Stencils
Photo stencils can create effective imagery for Construction Intaglio-Type.

Materials and equipment
Construction Intaglio-Type with photo stencils requires: a prepared plate; ImagOn; cutter with sharp blade; scissors; photo stencil; aquatint screen (optional); standard tray developing materials and equipment

Steps

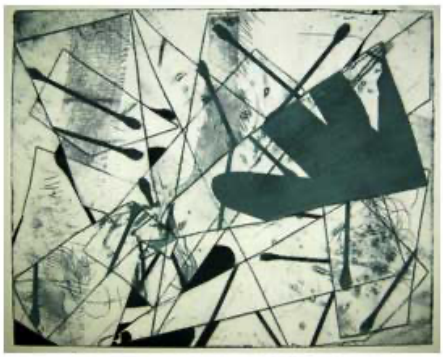
- Begin by cutting a few pieces of ImagOn and removing their protective layers.
- Laminate the pieces to the plate individually with a squeegee.
- Remove the Mylar from the laminated pieces before overlaying more ImagOn pieces to the plate.
- Continue overlaying as desired, laminating each piece with a squeegee and removing the Mylar. It is not necessary to cover the entire plate with pieces.
- After all pieces have been layered, cover the plate completely with a reserved Mylar at least as large as the plate.
- Run the plate through the press to facilitate bonding. Leave the plate overnight.
- Make a standard aquatint screen exposure if needed for the photo stencil.
- Make the image exposure with the photo stencil. The photo stencil shown *above* was previously manipulated in Photoshop to avoid the aquatint screen exposure: Curves were changed to 80% and 15% and the photo was printed onto an Azon 787N transparency with an Epson 7600 inkjet printer.
- Tray develop the exposed plate in the standard manner. Rinse; spray with vinegar; rinse; dry; heat dry. Expose the plate without a stencil for the same amount of time as an aquatint screen exposure. Set the plate aside overnight before printing.

Construction Intaglio-Type with Flat-Object Stencils
Flat objects can be used as stencils for imagery with Construction Intaglio-Type.

Materials and equipment
Construction Intaglio-Type with flat-object stencils requires: a degreased plate; ImagOn; cutter with sharp blade; scissors; aquatint screen; flat objects (such as spuds, tarlatan, and gloves in the printmaking studio); standard tray developing and spit-bite materials and equipment.

Steps

- Cut ImagOn-Ultra pieces and adhere to a prepared plate, leaving open areas. Remove the Mylar from the pieces before overlapping more pieces. Laminate each individual piece to the plate with a squeegee.
- Cover the entire plate with a large piece of set-aside Mylar and press laminate the plate.
- Make a standard aquatint screen exposure.
- Place flat objects on the construction ImageOn plate, such as the gloves and spuds and torn tarlatan with loose threads. Make a standard image exposure for flat objects.
- Remove the Mylar and tray develop according to standard development procedures.



- Sprinkle the plate with water to add more pieces of ImagOn, if desired. Remove the Mylar layers before overlapping and laminate each individual piece with a squeegee as you go. Again, press laminate with a large Mylar in place before another exposure with the aquatint screen followed by exposure with more flat objects. Remove the Mylar and hand develop.
- The *top photo* is a proof print made after two rounds of exposure and development.
- Again, sprinkle the plate with water to add more pieces of ImagOn, if desired. Remove the Mylar layers before overlapping and laminate each individual piece with a squeegee as you go. Again, press laminate with a large Mylar in place before another exposure with the aquatint screen followed by exposure with more flat objects. Remove the Mylar. Hand develop with standard spit-bite procedures.

- The *second photo* is a proof print made after three more rounds of exposure and hand development with spit-bite procedures.
- The *bottom* photo shows the print after further spit-bite development, cutting away layers of film and drypoint to increase blacks.

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Intaglio Type

33. Crackle Intaglio-Type

Crackle is an overall cracked effect associated with pottery glazes and glassware. Crackle can also be achieved with ImagOn photopolymer, with or without exposing the plate.

Crackle Intaglio-Type on an Unexposed Plate
When the ImagOn plate has not been exposed, the print shows black lines against a white background.

Materials and equipment
Crackle Intaglio-Type requires: ImagOn laminated to a prepared copper plate; prepared developing solutions and supplies; printmaking hot plate; Gum Arabic; small container; and brushes.

Steps

- Turn the printmaking hot plate on and set the temperature to 110°F ahead of time. The temperature should not become too hot for finger touching.
- Pour a small amount of Gum Arabic into a small container.
- Remove the Mylar from the unexposed ImagOn plate and place the ImagOn plate on the hot plate.
- Brush Gum Arabic on the unexposed photopolymer selectively or over the entire plate (*top photo*). The thinner the application of Gum Arabic, the quicker it dries and the finer the crackle.
- Crackles will be visible when the Gum Arabic dries. Remove the ImagOn plate from the hot plate.
- Tray develop the ImagOn plate in the standard manner: 9 minutes in developer, rinse, rub with vinegar, rinse, pat dry, heat dry, leave overnight to harden.

Construction Crackle Intaglio-Type on an Unexposed Plate
A variation of Crackle Intaglio-Type is to apply pieces of ImagOn to the plate instead of covering the plate with a single layer of ImagOn.

The Construction Crackle Intaglio-Type plate in the *bottom photo* was made by laminating pieces of ImagOn to the copper plate and then applying Gum Arabic to the unexposed plate. The plate was developed in the standard manner, rinsed, sprayed with vinegar, rinsed, dried, heat dried and left overnight before printing.
Note: Gum Arabic does not stick to open areas of the copper plate.

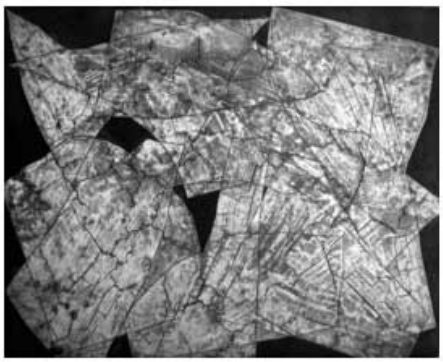
Construction Crackle Intaglio-Type with Aquatint Exposure
When the ImagOn plate has been crackled, the print shows black crackle lines against white or light areas of the image. Black crackle lines do not show up against black so it would not be effective to apply crackle to an ImagOn plate exposed only with an aquatint screen. However, a layer of ImagOn exposed with an aquatint screen and developed can have pieces of ImagOn laminated over the developed aquatint exposure layer; these pieces are never exposed and are hand-developed with spit-bite solution after Crackle Intaglio-Type is applied to the construction pieces.

Materials and equipment
Construction Crackle Intaglio-Type with aquatint exposure requires: ImagOn laminated to a prepared copper plate; prepared developing solutions and supplies; printmaking hot plate; Gum Arabic; small container; brushes and/or eye dropper; aquatint screen; and spit-bite solutions.

Steps

- Turn the printmaking hot plate on and set the temperature to 110°F ahead of time. The temperature should not become too hot for finger touching.
- Pour a small amount of Gum Arabic into a small container.
- Expose the laminated ImagOn copper plate with the standard exposure for an aquatint screen.
- Tray-develop the plate in the standard manner; rinse; spray vinegar; rinse; dry.
- Spray the plate with water.
- For Construction Crackle Intaglio-Type, apply pieces of ImagOn to the plate, removing the Mylar after laminating each piece with a squeegee.
- Cover the entire plate with Mylar or the protective film backing. Run the plate through the press to adhere the construction pieces to the bottom aquatint-exposure layer.
- Do not expose the construction plate. Remove the Mylar.
- Brush Gum Arabic on the construction plate but not on the aquatint-exposed bottom layer.
- Heat the construction plate until the Gum Arabic dries. Remove the construction plate from the hot plate.
- Hand-develop the construction layers with spit-bite solutions (*above*). Rinse; spray vinegar; rinse; dry; heat dry. Leave overnight before printing.

The Construction Crackle intaglio-Type in the *photo opposite* has an aquatint-exposed lower layer that was tray developed prior to construction layers for crackle; these non-exposed pieces were developed with spit-bite after Gum Arabic application in the manner described on this page.



Crackle Intaglio-Type with Photo-Stencil Image Exposure
Crackle Intaglio-Type can be applied over a laminated copper plate that has been exposed with a photo-stencil. The thinner the application of crackle, the quicker the gum dries and the finer the crackle.

Materials and equipment
Crackle Intaglio-Type with Image Exposure requires: ImagOn laminated to a prepared copper plate; prepared photo-stencil transparency; prepared developing solutions and supplies; printmaking hot plate; small container of Gum Arabic; and brushes.

Steps

- Manipulate the photograph in Photoshop as desired; end by changing the Mode to Grayscale and the Curves to 80% and 15% to avoid the necessity for an aquatint screen exposure. Print a transparency.
- Turn the printmaking hot plate on and set the temperature to 110°F ahead of time. The temperature should not become too hot for finger touching.
- Pour a small amount of Gum Arabic into a small container.
- Expose the laminated ImagOn copper plate with the standard exposure determined for the photo stencil.
- Place the exposed ImagOn plate on the hot plate. Protect the exposed ImagOn plate from direct sunlight by propping a cookie sheet against the hot plate if necessary.
- Brush Gum Arabic thinly on the plate for a fine crackle.
- When the Gum Arabic is dry, tray-develop the plate for 8½ minutes. Rinse; spray vinegar; rinse; dry, heat dry. Expose the plate without a stencil for the same amount of time an aquatint screen exposure requires. Leave the plate overnight before printing.

Note: The thinner the Gum Arabic is applied, the less time it takes to dry. This becomes significant for an exposed ImagOn plate. The long drying required for a thick application of Gum Arabic overexposes an image-exposed ImagOn plate. Covering the plate with a cookie sheet does not help since the cookie sheet delays drying.

Crackle Intaglio-Type with Photo-Stencil Image Exposure
Crackle Intaglio-Type can be applied over a laminated copper plate that has been exposed with a photo-stencil. The crackle shows up better on an image consisting mainly of light tones rather than dark tones.

Materials and equipment
Crackle Intaglio-Type with Image Exposure requires: ImagOn laminated to a prepared copper plate; prepared photo-stencil transparency; prepared developing solutions and supplies; printmaking hot plate; small container of Gum Arabic; and brushes.

Steps

- Manipulate the photograph in Photoshop as desired; end by changing the Mode to Grayscale and the Curves to 80% and 15% to avoid the necessity for an aquatint screen exposure. Print a transparency. The photo (*right*) has been manipulated in Photoshop, including the Mode and Curves changes in preparation for use as a photo stencil.
- Turn the printmaking hot plate on and set the temperature to 110°F ahead of time. The temperature should not become too hot for finger touching.
- Pour a small amount of Gum Arabic into a small container.
- Expose the laminated ImagOn copper plate with the standard exposure determined for the photo stencil.
- Place the exposed ImagOn plate on the hot plate. Protect the exposed ImagOn plate from direct sunlight by propping a cookie sheet against the hot plate if necessary.
- Brush Gum Arabic thinly on the plate for a fine crackle.
- When the Gum Arabic is dry, tray-develop the plate for 8½ minutes. Rinse; spray vinegar; rinse; dry, heat dry. Expose the plate without a stencil for the same amount of time an aquatint screen exposure requires. Leave the plate overnight before printing.

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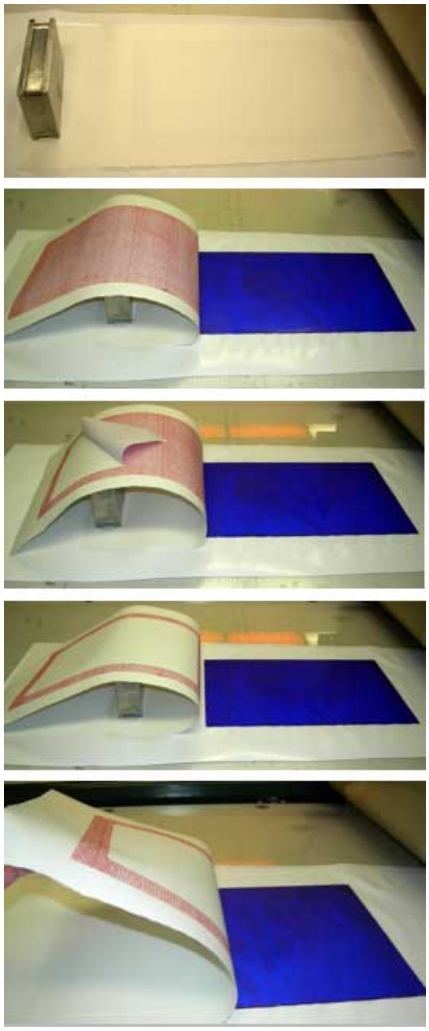
Intaglio Type

34. Ghost Printing with Paper Stencils



Paper stencils can be applied to the plate (or the printing paper) to selectively block areas of the inked plate from printing. The print shows white where the ink printed on the stencil instead of the printing stock.

A variation of this technique blocks the ink with a stencil for one run of the plate and then removes the stencil to re-print the same plate; this produces a ghost image in the area originally covered by the stencil.

Materials and equipment
Printing Intaglio-type with paper stencils requires: an inked ImagOn plate; standard printing supplies and equipment; opaque paper for stencils.

Steps

- Position the plate on clean newsprint on the press bed.
- Position torn or cut paper on the plate in selected areas.
- Run the paper-stencil-plate sandwich through the press once. At this point, the final print would appear white where the stencil is located.
- To produce a ghost image, hold the printing stock in place by bricking (i.e., positioning a weight on the print at the end farthest from the press rollers) as in the *top photo*.
- Fold the end of the print closest to the rollers over the brick (*second photo*).
- Remove the stencil from the printing stock by lifting from one corner (*third photo*).
- The stencil is totally removed in the *fourth photo*.
- Carefully reposition the printing stock over the plate (*fifth photo*). Remove the brick.
- Run the plate and printing stock through the press a second time, but without the stencil for the second run-through. A lighter ink now appears where the stencil was removed.

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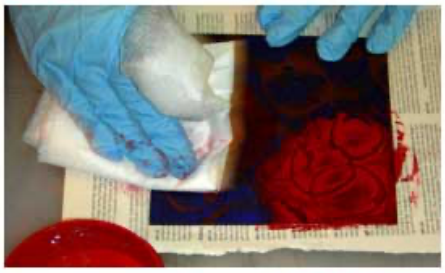
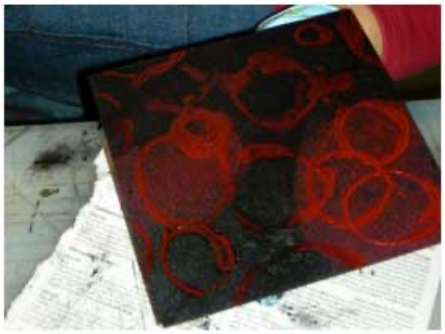
Intaglio Type

35. À la Poupée Inking





Poupée is French for doll or dollie. À la poupée is the easiest way to print with more than one color: apply two or more ink colors selectively to a single plate with a felt dauber or rag wadded in a shape somewhat reminiscent of a doll. Only one run through the press is necessary to achieve multiple colors in the print.

Materials and equipment
À la poupée requires: an exposed and developed ImagOn plate; two or more Akua ink colors; one section of 4 x 6 inch heavy felt or rag for each color; cord or packaging tape; plastic wrap and Ziploc bag for each color; standard inking and printing supplies and equipment

Steps

- Make a dauber for each color by rolling the felt tightly and securing it with cord or packing tape; or make a dollie by making a ball with rag material and tying a cord around the ball.
- Apply the lightest ink color to selected areas of the plate with a dauber. Red ink has been applied to two areas of a Mezzo-Type plate in the *top photo*.
- Remove excess ink with pellon and/or newsprint (*second photo*).
- Apply the second (or next lightest) ink color to selected areas with a second dauber. Remove excess ink with pellon and/or newsprint, blending colors where they meet. The *third photo* is the Mezzo-Type plate inked with red and black in distinct areas.
- If more colors are intended, continue in the same manner.
- Print the plate. The *bottom photo* shows the two-color print being lifted from the plate.

To store the daubers, wrap them in plastic wrap and place them in a Ziploc bag.

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Intaglio Type

36. Digital-Halftone Intaglio-Type for Process Color Photo Stencils

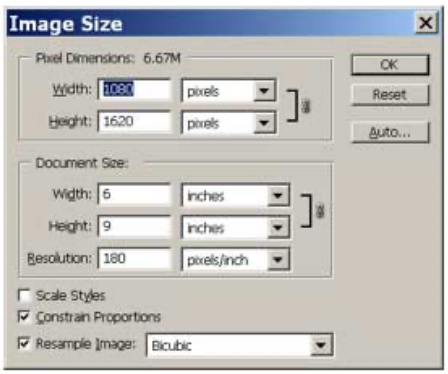
Colored photographs can be printed as non-etch Digital-Halftone Intaglio-Type on four plates with process (CMYK) colors. To avoid the necessity of an aquatint screen exposure prior to the image exposures, make the Dot Structure Density Test for the transparency and inkjet printer to determine the density that opens up 100% blacks to an 80% random dot structure. Create a digital halftone for each color channel in Photoshop.

Manipulate the Image in Photoshop

Materials and equipment
Digital-Halftone Intaglio-Type for Process Color Photo Stencils: Manipulating the image requires: film or digital photograph; Photoshop (or other image-manipulation software); transparency, such as Azon 787N Clear Graphic Film; and an inkjet printer, such as Epson PRO 7600.

Steps

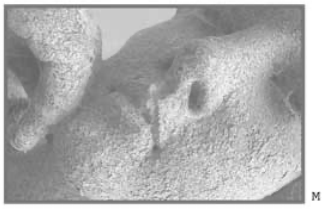
- Open the original photo file and save as a new tiff file in a new folder to preserve the original file (*top right photo*). Work with the duplicate file.
- Change the size to fit the transparency: Image, Image Size, uncheck Resample Image. Fill in the inches. Click OK.
- Change the resolution so it is at least 1/4th the printer output, 720 on the Epson PRO 7600 (some say 1/6th or 120): Image, Image Size. Check Resample Image, Bicubic, and Constrain Proportions, as in the top right figure.
- Crop the image if it improves the image or if needed to fit the transparency: Select with a Marquee Tool; then Image, Crop.
- Straighten any angled lines: Select, All; Edit, Transform, Skew.
- Straighten the image if needed: Image, Rotate, Arbitrary; fill in degrees and CW or CCW.
- Improve the contrast: Image, Adjustments, Levels. Move the sliders as needed to get black and white. Save as a new tiff file.
- Adjust the midtones: Image, Adjustments, Curves. Move the diagonal as needed.
- Adjust saturation and/or lightness: Image, Adjustments, Saturation; move the sliders as needed to improve the image. If the image was scanned, sharpen the image in increments; do not sharpen digital camera images, such as this image. To sharpen: Filter, Sharpen, Unsharp Mask, check Preview. Use 25-50%, 1-3 Radius, 0-2 Threshold. Save as a new tiff file. If needed, repeat these steps and save as another new tiff file.
- Magnify the image with the Zoom Tool in the Toolbox to remove defects with the Clone Tool or Band-aid Tool. Save as a new tiff file.
- Change the mode: Image, Mode, CMYK. Save as a new tiff tile.



Prepare the Digital-Halftone Stencils
If any of the four colors in the image do not touch all edges, add a border to assist registration. After performing the dot structure density test for the printer and transparency and determining the percentage with the blackest black, adjust the image accordingly.

Steps

- To create a border, select Black as the foreground color in the Toolbox. Select, All. Edit, Stroke. In the drop-down menu: select Inside, Blending Normal, 100%.
- Obviate the need for an aquatint exposure by lowering the density of blacks in Curves: Image, Adjustments, Curves; then drag the black diagonal to the percentage determined by the dot structure density test. The best black prints at 80% for Azon 787N Clear Graphic Film in an Epson PRO 7600 Printer.



- To assist registration when K will be the last color printed, feather the edges in the CMY Channels: Select CMY Channels; Filter, Blur, Gaussian Blur, .5; Filter, Noise, Add Noise, .5 Gaussian. Save as a tiff file.
- Split the Channels: Channels, Split Channels. Four grayscale files pop up, as shown. Initial each file the appropriate color with the Text tool. Save the four files.

- Set the printer to best quality, Black. If the printer has the option, print with two cartridges of matte black ink. To print AZON 787N Clear Graphic Film in the Epson PRO 7600 Inkjet Printer: Select the printer and film size; in Print Settings, select Black, Adhesive Vinyl, Advanced (uncheck all boxes), 720 dpi.
- Print on the emulsion side of the transparencies. Be careful handling the transparencies to avoid fingerprints that could block light.
- Label each ImagOn plate with CMY or K and make an arrow in the lower left "key" corner of each plate. Expose each plate with its corresponding transparency. Develop; rinse; spray vinegar; rinse; dry; heat dry. Set aside overnight.

Registration with a Template

Copper plates need to be registered with a template. This method also works for P.E.T.G. plates.

Materials
Process Color Intaglio-Type requires: 4 exposed and developed ImagOn plates; standard inking and printing supplies; Akua inks: Hansa Yellow, Crimson Red, Phthalo Blue, Carbon Black; tissue paper; clean paper and pencil; Scotch tape.

Steps

- Trace a plate near one end of a long sheet of paper; this becomes a template for registration.
- Tear a long sheet of paper. Cut four pieces of tissue paper slightly larger than the plates.
- Ink each plate with its associated color (*photo opposite*). Use a separate pair of gloves for each color for inking and wiping.

- Place the yellow plate on a cut tissue paper. Register the lower left corner of the yellow plate on the template through the tissue. Run the paper, tissue and template through the press but keep the end of the paper and template trapped under the press roller. Lift the paper and tape to the press. Remove the yellow plate and its tissue.
- Position the red plate on a cut tissue paper. Register the lower left corner of the red plate (*opposite*). Run the plate through the press twice without loosening the printing stock. Lift the paper and tape to the press. Remove the red plate and its tissue.

- Position the cyan plate on a cut tissue paper (*opposite*). Register the lower left corner and print as before. Lift the paper and tape to the press. Remove the cyan plate and its tissue.

- Position the black plate on a cut tissue paper (*opposite*). Register the lower left corner and print as before. Lift the paper and tape the final print to the press. Remove the black plate and its tissue.
- Loosen the press and remove the final print and the template paper.

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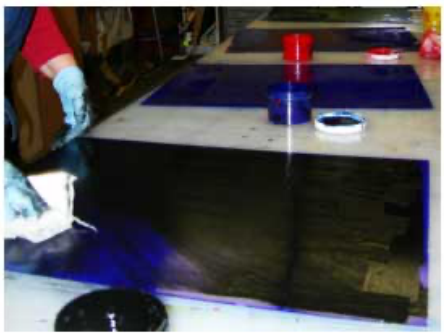
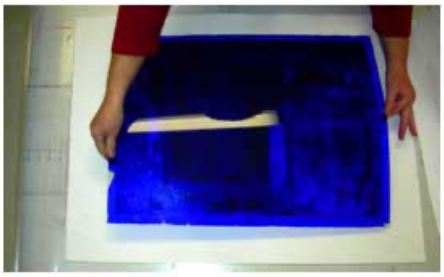
Intaglio Type

37. Four Color Inversion Printing



The introduction of see-through P.E.T.G. plates has permitted the development of 4-Color Inversion Printing. Instead of positioning plates under the printing stock on a template for registration, the plates are positioned one-by-one on the printing stock and registered by looking through the MCK plates at the image below after the Y plate has been run through the press. A headlight facilitates accurately positioning the plates. Images no longer need to be carefully aligned on the plates. This new way of registration has facilitated a new edge aesthetic where edges of plates overlap.

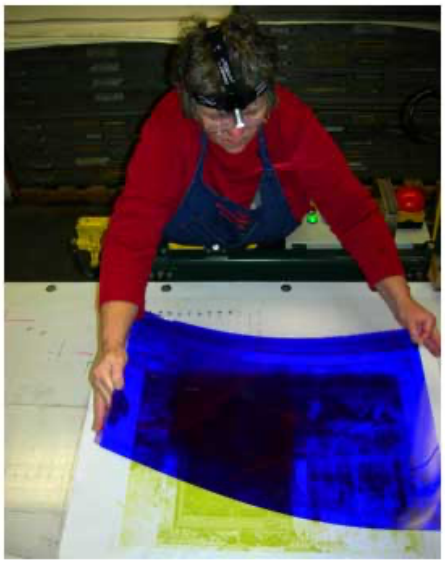
Materials and equipment
4-Color Inversion Printing requires: four-color laminated, exposed, and developed ImagOn plates for an image converted to CMYK; standard inking and printing supplies, including Akua Hansa Yellow, Crimson Red, Phthalo Blue, Carbon Black; headlight; prepared printing stock; clean paper larger than the printing stock.



Steps

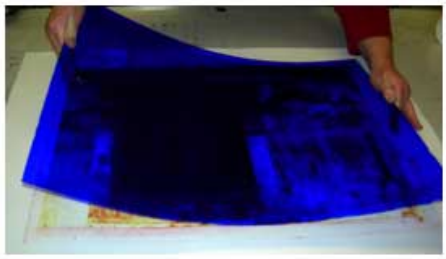
- Soak the paper for 15 minutes or work from a wet pack prepared a day ahead.
- Ink and wipe the four exposed and developed ImagOn CMYK plates wearing separate gloves for each color (*top*).
- Calendar the printing stock: place the dampened sheet of printing stock on the press and run it through a press with a clean sheet of paper on top. Remove the protective paper.
- Position the yellow plate face-side-down on the calendared stock (*second photo*). Cover the stock and plate with paper. Run through the press.
- Remove the protective paper. Lift the yellow plate from the paper (*third photo*).

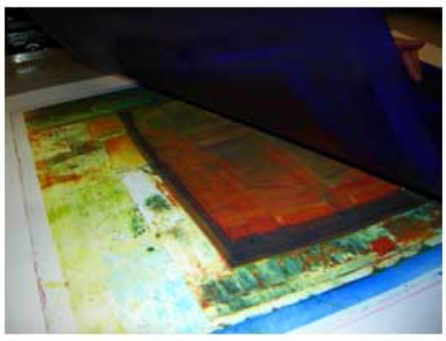
- Wearing the headlight to aid positioning, place the red plate face-side-down on the printing stock in alignment with the yellow image (*fourth photo*). Cover the stock and plate with paper. Run through the press.



- Remove the protective paper. Lift the red plate from the paper (*fifth photo*).

- Wearing the headlight to aid positioning, place the cyan plate face-side-down on the printing stock in alignment with the yellow-red image (*sixth photo*). Cover the stock and plate with paper. Run through the press.

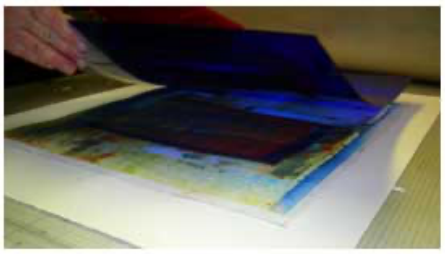




- Remove the protective paper. Lift the cyan plate from the paper (*seventh photo*).

- Wearing the headlight to aid positioning, place the black plate face-side-down on the printing stock in alignment with the yellow-red-cyan image (*eighth photo*). Cover the stock and plate with paper. Run through the press.

- Remove the protective paper. Lift the black plate from the paper (*ninth photo*).



- The *bottom* photo is the 18 x 24 inch final print produced with CMYK digital-halftone transparencies and printed with the 4-Color Inversion method.

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Intaglio Type

38. Printing with Chine Collé

Chine Collé (from the French *chine collée* - literally "Chinese paper attached") is a method of collaging any paper for color or textural interest to printing stock whilst printing the plate. A glue stick is adequate for adhering small pieces of paper to the printing stock. Potato starch, wheat paste or 3M Scotch 568 Positionable Mounting Adhesive (PMA) work better for adhering larger pieces of paper.

Materials and equipment
Chine Collé requires: a prepared and developed plate; a roll of 3Ms PMA; prepared printing stock; lightweight paper contrasting in color and/or texture; inking and printing supplies.

Steps

- Cut one or more shapes from contrasting paper.
- Position the cut shape(s) on the adhesive side of the PMA roll; cover with the supplied cover sheet. Squeegee with the supplied squeegee to adhere the shape(s) to the adhesive (*top photo*).
- Remove the cover sheet (*second photo*).
- Lift the adhesive-backed shape(s) from the PMA support sheet (*third photo*).
- Position the shape(s) on the plate with the adhesive side up OR position directly on the printing stock with the adhesive side down and push down as needed for printing with a P.E.T.G. plate (*fourth photo*).
- Position the plate on the printing stock. Run the plate, shape(s) and printing stock through the press.
- Lift the plate from the print (*bottom right photo*).
- The photo at *bottom left* shows the 16 x 20 inch print produced with the images shown here.

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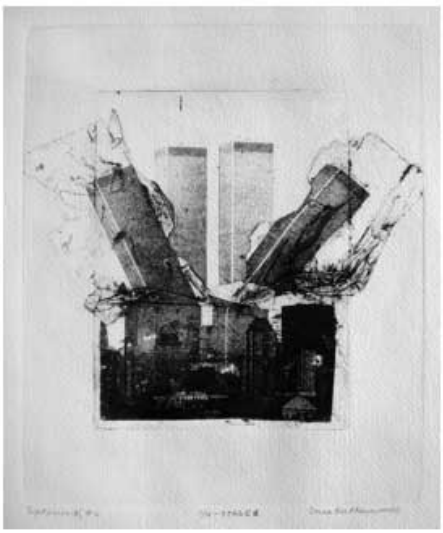
Intaglio Type

39. Reworking Techniques

Reworking ImagOn plates is much easier than reworking traditional intaglio plates. Spit-bite and Mezzo-Type are used for reworking ImagOn plates as well as stand-alone Intaglio-Type techniques. Liquid Aquatint is usually reserved for reworking ImagOn plates. All three techniques can be used alone or in combination to rework a plate.

Reworking with Spit-bite
Spit-bite permits reworking areas of an ImagOn plate that need more development to produce a rich black, whether under-developed or under-exposed. This is particularly useful for plates with the full range of tones that are exposed to keep the light tones when further exposure is needed to produce the richest blacks. Hand-developing with various concentrations of soda ash developer also permits developing through one layer of ImagOn to reveal areas of a lower layer after the initial development of Layered-Intaglio or Wrinkled-Intaglio plates.

Materials and equipment
Reworking with Spit-bite Intaglio-Type requires: prepared concentrations of developer solution: Mild (10 grams soda ash per liter of water), Medium (25 grams soda ash per liter of water), and Strong (50 grams soda ash per liter of water); laminated and printed ImagOn plate that requires reworking to produce the best image; brush; water in a small container; vinegar in a spray bottle or tray; paper towels.



Steps

- Brush one or more concentrations of developer onto the single layer of a developed, dried plate in the area requiring a richer black or onto the upper layer of ImagOn where areas need to be removed on a Layered-Type or Wrinkled-Type ImagOn plate.
- When the developer turns light blue, rinse the plate with cool tap water.
- Reapply as needed and rinse with cool tap water after each application.
- Spray the plate with vinegar to stabilize it.
- Rinse the plate with cool tap water.
- Heat dry the plate with a commercial hand drier or heat gun.
- Sun dry the plate for 30 minutes or expose it without a stencil for the length of time used for the standard aquatint exposure.

The photo (*right*) is Stage 1 of the final print. This Wrinkled-Type image was improved by removing uninteresting areas of the top layer.

Reworking with Liquid Aquatint and Mezzo-Type
Liquid Aquatint Intaglio-Type permits a rich black when applied directly onto a prepared plate but is usually reserved for reworking a developed ImagOn plate. It is often used in combination with other reworking techniques, such as Spit-bite and Mezzo-Type to increase the tonal range and add textural as well as tonal interest.

Materials and equipment
Reworking with Liquid Aquatint and Mezzo-Type requires: a small container; screenfiller; stirring device; carborundum grit (100 or 200 grit); paint brushes; prepared unlaminated plate or developed ImagOn plate; inking and printing supplies.

Steps

- Add a small amount of screenfiller to a container.
- Stir in carborundum grit to the desired consistency; for the richest black, add enough grit to make the mixture the consistency of oil paint, slightly thicker than cream.
- Paint the mixture directly onto a prepared plate or onto an ImagOn plate. Be sure the mixture is completely dry before proceeding.
- Apply Spit-bite over Liquid Aquatint to remove undesired areas; rinse with water; spray vinegar; rinse again. Be sure the Liquid Aquatint is dry before proceeding.
- Rework screenfiller over dry Liquid-Aquatint to introduce lighter tones if desired. Dry the plate.
- When all reworking is complete and the plate is completely dry, print the plate.

The *top photo* is Wash-Drawing Intaglio-Type with Spit-bite applied to the ImagOn plate for edge interest. Stage 2 of the same ImagOn plate resulted from reworking alternately with Mezzo-Type and Liquid Aquatint Intaglio-Type, drying between each application (*bottom photo*). Note that Liquid Aquatint adheres to open areas of the plate as well as to the film.

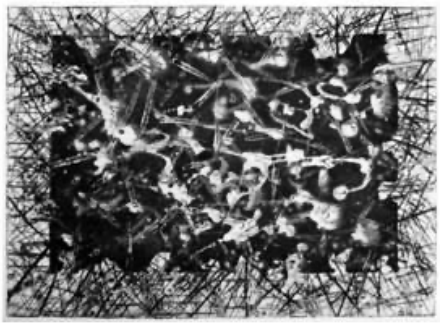
Reworking with Mezzo-Type in Combination
Mezzo-Type can be reworked on an ImagOn plate alone or in combination with other reworking techniques, such as Spit-bite, Liquid Aquatint or drypoint to introduce lighter tones. Mezzo-type adds gray tones when painted directly onto a prepared plate.

Materials and equipment

Reworking with Mezzo-Type requires: a small container of screenfiller; stirring device; painting tools; developed ImagOn plate; inking and printing supplies.

Steps

- Apply screenfiller to the ImagOn plate with a brush, toothbrush or eyedropper. Rinse off after the screenfiller partially dries, if thin lines are desired. Be sure the plate is completely dry before proceeding.
- Apply more screenfiller, if desired, alone or alternately with Liquid Aquatint or Spit-bite, drying between applications.
- When reworking is complete and the plate is dry, print the plate.

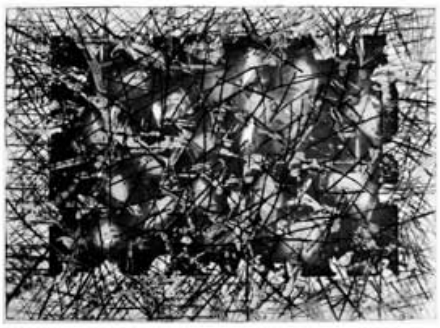


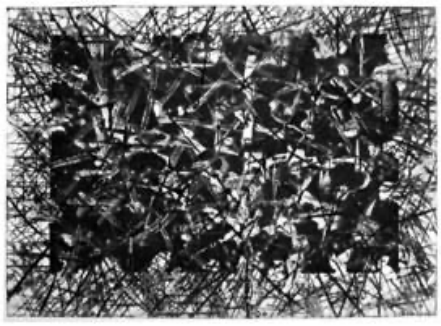
The *top photo* is the plate worked initially with drypoint and Mezzo-Type on the aquatinted ImagOn film and directly on the plate. Film edges were randomly lifted with masking tape.

The *second photo* is Stage 2 of the same plate reworked with Spit-bite, drypoint, and Mezzo-Type.

The *third photo* is Stage 3 of the same plate reworked with the same three techniques.

The *photo below* is Stage 4 of the same plate reworked with Spit-bite and drypoint.





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Metal Salt Etching

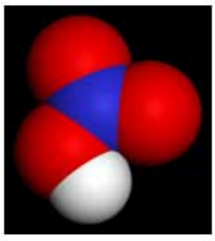
1. Compared to Traditional Intaglio

Traditional Intaglio Etching Chemistry

Intaglio (from the Italian *intagliare*, to cut) is a category of printmaking techniques that creates depressions in a flat metal plate to hold ink. Intaglio includes engraving, drypoint, mezzotint and aquatint. Etching, the fastest and most preferred technique, requires exposure to toxic chemicals, including nitric acid or Dutch mordant to chemically etch exposed areas of the metal plate, asphaltum and rosin dust as grounds to resist etching and polycyclic aromatic hydrocarbons (PAH) as cleaning and thinning solvents.

Nitric acid etching solution

Nitric acid (HNO_3) is highly corrosive and creates odorless toxic nitrogen dioxide fumes that are absorbed by the skin as well as by inhalation; the fumes can cause chemical pneumonia with acute exposure or emphysema with chronic exposure. The molecular structure is shown at the *right* (source: Wikipedia Online Dictionary). Contact of nitric acid with chlorine produces lethal mustard gas!

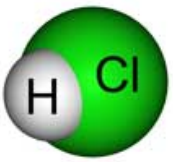


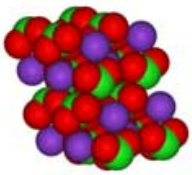
Material Safety Data Sheet (MSDS) information on nitric acid hazards states:

> *Poison! Danger! Strong oxidizer. Contact with other material may cause fire. Corrosive. Liquid and mist cause severe burns to all body tissue. May be fatal if swallowed or inhaled. Inhalation may cause lung and tooth damage.*

Dutch mordant etching solution

Dutch mordant contains diluted hydrochloric acid (HCl) and potassium chlorate (KClO3); the molecular structure of hydrochloric acid is shown at the *right* above the molecular structure of potassium chlorate (source: Wikipedia Online Dictionary). Dutch mordant produces toxic chlorine gas fumes that cause acute respiratory damage. The potassium chlorate in Dutch mordant is a strong oxidizer that can cause fire or explosion. Graphic Chemical & Ink Company, a printmaking supplier, has refused to carry the ingredients for Dutch mordant since the 1980s.





Asphaltum and rosin dust resists
Asphaltum, a traditional resist, contains PAH which vaporizes above 200°F and is a probable carcinogen.
Material Safety Data Sheets says of asphaltum:

> *Vapors may be irritating to nose, throat and respiratory tract. High concentrations cause headaches, dizziness, nausea, drowsiness, anesthesia, and unconsciousness and can result in death. Vapors and liquid can cause eye irritation, redness, tearing and blurred vision...IARC monographs list refined bitumens as possibly carcinogenic to humans based on animal studies.*

Rosin dust, the traditional aquatinting resist, is highly explosive according to MSDS.

Safer Etching Chemistry
Liquid ferric chloride (FeCl3) is a metal salt that produces no toxic fumes. Ferric chloride and The Edinburgh Etch (ferric chloride mordanted with citric acid, a chemical often found in foods) permit safer chemical etching of copper and brass plates. The Saline Sulfate Etching Solution provides a safer etch for zinc, aluminum and steel. Chemists at Rochester Institute of Technology who tested both solutions found that they give off no toxic fumes and permit safe disposal. Liquid acrylics (such as Future or screenfiller), wax, and fat are safer resists. Gum-based Akua inks are safer than oil-based inks. Vegetable oil and soap are safer cleaning agents than traditional hydrocarbons.

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Metal Salt Etching

2. Edinburgh Etch

Ferric Chloride Unmordanted
Ferric chloride (FeCl3), a metal-salt, is a safer etchant for copper and brass (think: warm-colored etchant for warm-colored metals); etching both in the same tank affects their surfaces but not the prints. FeCl3 generally lasts 2+ years if lidded when not in use to avoid evaporation. It gives off no toxic fumes and permits safe disposal when exhausted. Liquid FeCl3 is safely handled wearing industrial gloves and goggles. Purchase the saturated industrial grade rather than the weaker and more expensive laboratory grade. Use undiluted; it is most effective at 42-48 Baume. Rule of thumb: if it etches too quickly, add water; if too slowly, add ferric chloride. To remove the sting from new solution, dissolve a piece of copper overnight or add a cup of exhausted solution.

A disadvantage of unmordanted FeCl3 solution is that it forms a crusty copper hydroxide sediment on the etching plate which impedes further etching unless etched in a vertical etching tank or placed upside down in a tray on supports (to avoid sitting in sludge). Edinburgh Etch adds a mordant to FeCl3 to overcome this disadvantage.

Important safety rules: Etching iron or aluminum with FeCl3 causes explosive chemical reactions. Avoid crystalline FeCl3 which gives off chlorine gas for six hours after adding water. Avoid heating ferric chloride solution to preclude producing toxic chlorine gas.

Edinburgh Etch = Mordanted Ferric Chloride
Edinburgh Etch is FeCl3 solution mordanted with anhydrous citric acid (a chemical found in foods) to prevent the crystallization of copper hydroxide. Edinburgh Etch forms no sedimentation and no sludge, so copper or brass plates can be etched face-up in a tray. Edinburgh Etch works twice as fast as unmordanted FeCl3 solution in a tray and four times as fast in a vertical etching tank (approximately 30-40 minutes). Edinburgh Etch is 1 part citric acid solution to 4 parts ferric chloride solution. Citric acid solution is 1 part anhydrous citric acid crystals (available from chemical or food suppliers) to 3 parts hot water by volume. Edinburgh Etch is as safe as unmordanted FeCl3; it produces only copper ions, hydrogen and oxygen. Note: The same important safety rules for unmordanted FeCl3 etching solution apply to Edinburgh Etch!

Materials and equipment
Preparing Edinburgh Etch requires: measured liter container; plastic spatula; 750 ml water heated in an electrical teapot; 4 liters saturated ferric chloride solution; 250 grams anhydrous citric acid crystals; 1 cup of exhausted solution or a scrap of copper; vertical etching tank or large tray and wooden stirring stick; industrial gloves and goggles.

EDINBURGH ETCH
=
1 PART CITRIC ACID SOLUTION
+
4 PARTS FERRIC CHLORIDE SOLUTION

Edinburgh Etch Recipe

Wear industrial gloves and goggles throughout the preparation.

- Pour 4 liters ferric chloride solution in a tray or tank.
- Pour 750 ml hot water in a measured liter container.
- Add 250 grams citric acid crystals to the hot water; the water will rise to 1 liter.
- Stir until the crystals totally dissolve; without stirring they will not dissolve, and will leave dots on the etching plates.
- Pour 1 liter of citric acid solution slowly into 4 liters of ferric chloride, gently stirring.
- Remove the sting of new Edinburgh Etch by adding 1 cup old solution or dissolving a small piece of copper in the tank overnight.

Edinburgh Etch is long-lived
Edinburgh etch is a supersaturated solution; it can take as much metal as solution so it last a long time; its weight will eventually double even though the space remains the same! It becomes more viscous over time, but still works. Lengthen its life by keeping the lid on the tank when not etching or storing in the original ferric-chloride-solution containers when not using for long periods. Eventually, Edinburgh Etch will become exhausted. A simple paper-strip test can determine when to discard the solution and make a new batch.

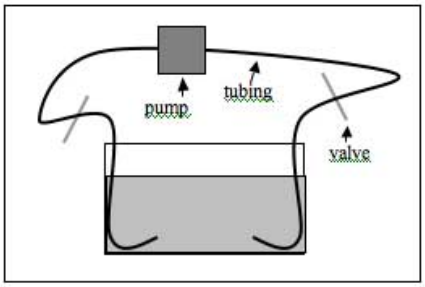
Paper-Strip Test for Exhausted Edinburgh Etch
Insert a strip of white paper (approximately 1 x 4 inches) in Edinburgh Etch. The paper strip turns golden in new solution. Over time, Edinburgh Etch turns a white paper strip olive green - the more olive green, the slower the etchant works since the solution contains an increasing number of copper ions. When an inserted strip of white paper turns black-olive green, the solution is exhausted. Remember to save a cup of exhausted solution to remove the sting from a new batch!

Disposal of Exhausted Edinburgh Etch

- Exhausted Edinburgh Etch is slightly acidic so must be neutralized as well as diluted before pouring down the drain to avoid affecting copper plumbing pipes. Concentrated ions are also a marine pollutant.
- Dilute exhausted solution in a bucket with water.
- Sprinkle sodium carbonate (also called soda ash or washing soda) to neutralize the diluted solution. Stir with a wooden stick.
- CO2 gases form as the solution foams; let the solution sit until the foam subsides.
- Flush the neutralized solution down the sink drain with running tap water - it is mostly iron oxide after dilution and neutralization.

Vertical Etching Tank Set-up
Plates etch faster vertically in a tank (*right*) than flat in a tray. Aeration with a double-tubed aquarium pump further accelerates etching of plates with hard ground or ImagOn resists. Note: do not aerate plates with soft ground or aquatint resists, which are more delicate.

- Purchase a vertical etching tank (or choose any polypropylene tub deeper than the height of the plate from a local hardware store).
- Purchase a mid-size (or larger) double-tubed aquarium pump, tubing and two one-way valves from a pet store.
- Set the pump on a flat surface near the vertical etching tank and near an electrical outlet.
- Cut two tubes long enough to reach from the pump, travel down the sides of the tank and extend to the center bottom of the tank.
- Attach a one-way valve to each tube.
- Tape the tubes on the side and bottom of the tank so tube ends rest on the bottom of the tank.



The figure (*right*) represents the aeration set-up. The aquarium pump is located outside the tank. Tubes with one-way valves extend from either side of the pump; the tubes run down the sides and along the bottom of the etching tank. When plugged in, air travels upward from the center bottom of the tank.

De-Oxidant Solution
Always de-oxidize a copper or brass plate each time it is lifted from Edinburgh Etch. Oxidation occurs whenever the plate is exposed to air or water. The oxidation coating prevents further etching if the plate is re-submerged in Edinburgh Etch (or unmordanted ferric chloride solution) and prevents any additional acrylic resists adhering to the plate. Note: de-oxidizing does not adversely affect ImagOn or acrylic resists on the plate.

Materials and Equipment
Preparing the de-oxidant solution requires: a measured liter container; plastic spatula; water heated in an electric kettle; plastic tray or tub; sodium chloride (i.e., common table salt) and vinegar from a grocery.

Recipe for De-oxidant Solution
Proportions for the de-oxidant are 1 part sodium chloride : 1 part vinegar : 2 parts hot water (heated water dissolves the salt crystals more easily). Mix enough de-oxidant solution to cover the plate.

For each liter of solution:

- Pour 500 ml heated water in the measured liter container.
- Add sodium chloride to the 750 ml mark and stir to dissolve the salt crystals.
- Add vinegar to the 1 liter mark.
- Pour into the labeled tray or container.

De-oxidizing a plate

- After removing a plate from Edinburgh Etch (or ferric chloride), rinse with water.
- Dip the plate in de-oxidizing solution for approximately 1 minute.
- Remove the plate and rub it gently with a sponge. Dip again. Note: skip this step for a plate with soft ground or aquatint resist.
- Rinse quickly to avoid oxidation.
- Pat dry immediately, then dry thoroughly under hot air or on a hot plate.

Stripping Solution
Strip ImagOn or acrylic resists from an etched plate after the edition is complete in the same manner as non-etch plates. Sodium carbonate (also called soda ash or washing soda) is ideal because it is non-corrosive and results in *saponification* (i.e., soap) which is not toxic. Stripper is slightly defatting to the skin, so wear gloves. Exhausted solution can be safely discarded down the sink.

Materials and Equipment
Preparing the stripper requires: measured liter container; plastic spatula; electric teapot; water; polypropylene tank or tub for solution; anhydrous sodium carbonate; paper towels.

Recipe
Proportions are 1 sodium carbonate : 4 parts hot water.
For each liter of stripping solution:

- Pour 800 ml heated water into a measured liter container.
- Add anhydrous sodium carbonate to the 1 liter mark. Stir to dissolve the soda carbonate.
- Pour the solution into a labeled polypropylene tank or tub.
- Insert the etched plate to strip the resist.
- After stripping, remove the plate. Rinse well with water. Pat dry; heat dry if desired.

Etch Copper and Brass

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Metal Salt Etching

3. Copper and Brass Plates

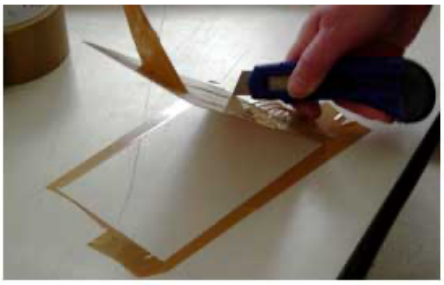

Plate Preparation

Materials and equipment
Plate preparation requires: deburring tool; bastard file; palm sander plus 600-grit and 400-grit wet-dry sandpaper; fine steel wool; bonami (or Ajax or Comet); sponge or pot scrubber; paper towels; self-adhesive shelf liner (optional); packaging tape; and blade.

Steps

- Roofing copper does not need to be beveled. Bevel the edges of a new thicker plate with a deburring tool (or file, scrape and burnish) to avoid harming the press.
- Soften the sharp corners of a new plate with a bastard file.
- Plate scratches show in the print. Remove all scratches with the circular motion of a palm sander fitted with 600-grit wet-dry sandpaper. For deep gouges, use 400-grit sandpaper and follow with 600-grit sandpaper. Work wet to avoid the health hazard of creating dust.
- Rub the plate with fine steel wool to smooth sanding marks.
- Resists will not stick to grease or oil, including fingerprints. Rub bonami (which does not contain bleach so is kinder to the environment) or Ajax or Comet with a pot scrubber to degrease the plate. Rinse well. The water should flow equally everywhere. If not, degrease and rinse until no oil remains.
- Dry the plate with a paper towel; avoid touching the degreased surface.
- Some printmakers cover the back of the plate at this point; others wait until after the resist has been applied.
- To protect the back of the plate when etching, cover it with self-adhesive shelf liner or overlapped packaging tape, as in the *top photo*.
- Make a long suspension hanger with packaging tape and attach it to the back of the plate, as in the *middle photo*.
- Remove excess with a blade, as in the *bottom photo*.

The prepared plate is now ready to apply any of the etching grounds, or resists, described in-depth below. Then follow the etching process in the next topic. Only etch copper or brass plates with Edinburgh Etch (or unmordanted ferric chloride solution). Remember: warm-colored plates with warm-colored etchant.

Standard Etching of Copper and Brass

Prior to etching: fill an aerated vertical etching tank with Edinburgh Etch and prepare de-oxidant solution as described in the Edinburgh Etch topic; prepare the plate according to the previous topic, and apply a ground, or resist, to the degreased front of the plate using any of the techniques outlined below. Etch copper or brass only in Edinburgh Etch; etch no other metals in Edinburgh Etch. The rule is: warm-colored plates in warm-colored etchant.

Materials and equipment
Etching the plate requires: aerated vertical etching tank fitted with Edinburgh Etch; prepared and backed plate with applied ground; permanent marker; plastic or wooden clothes pin; timer; industrial gloves and goggles; de-oxidizing solution; paper towels; hotplate.

Steps

- Leave ImagOn-resist plates overnight. Heat acrylic-resist plates on a hotplate set at Low for 20 minutes or until all acrylic is dry. Do not heat fat- or wax-resist plates.
- Suspend the plate in the vertical etching tank with the resist side facing the solution, (*top photo)*.
- Attach the packaging-tape hanger to the etching tank with a clothespin (*second photo*).
- With a permanent marker, write your initials and the insertion time at the top of the hanger.
- Turn on the aerator; do not use aeration for soft-ground or aquatinted plates.
- Wear gloves and goggles at all times when handling plates coated with etchant.
- Lift the plate periodically to check the depth of etching, as in the *bottom photo*. As the etchant ages, more time will be required for the same depth.
- Deoxidize the plate after each removal from the Edinburgh Etch and reinsert as needed for image development.
- When etching is the desired depth, remove from the etchant. Rinse the plate.
- Sponge the plate with bonami or dish detergent to begin removing the ground. Rinse.
- Strip the ground from the plate in stripping solution.
- When all ground is stripped from the plate, rinse the plate. Blot dry. Heat dry for 15-20 minutes on Low.

Shortly before inking the plate for printing, deoxidize the plate as described in the previous topic; rinse, pat dry; and heat dry the plate.
Prepare the paper, print the edition, dry the prints and label them according to the techniques presented in previous sections.

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Metal Salt Etching

4. Saline Sulfate Etch

Zinc, Aluminum and Steel Plates
Zinc, aluminum and steel plates produce rough, unpredictable surfaces with less crisp lines than copper or brass. They are prepared as copper and brass plates but etched in a different solution. Zinc, aluminum and steel plates are cool colored as is their etchant - an easy way to remember the appropriate etchant. Both Bordeaux Solution and Saline Sulfate Solution are safe etchants for zinc, aluminum and steel. Never de-oxidize these plates after etching! Clean them and remove resists in the same manner as for copper and brass.

Bordeaux Etch
Bordeaux Etch is a copper sulfate etching solution. Copper sulfate is a metal salt used in the Bordeaux wine industry to prevent fungus. Bordeaux Etch forms a crusty sediment on the etching plate which impedes further etching unless etched in a vertical etching tank or placed upside down in a tray on supports (to avoid sitting in sludge).

Saline Sulfate Etch
Saline Sulfate Etch is the Bordeaux Etch mordanted with sodium chloride (i.e. common table salt). This is the preferred metal salt etchant for cool-colored metals since the coppery sediment floats to the surface where it does not impede etching. Saline Sulfate Etch etches two to three times faster than Bordeaux Etch, makes a less rough surface, and is less quickly exhausted. To extend the useful life of Saline Sulfate Etch, skim the surface with a brush or strainer to remove the floating coppery sediment. Even with skimming, Saline Sulfate Etch exhausts more quickly than Edinburgh Etch. When exhausted, the etchant becomes transparent. Zinc, aluminum and steel can be etched in the same tank (unlike copper and brass which need separate solutions of Edinburgh Etch).

Materials and equipment
Mixing Saline Sulfate Etch requires: industrial or production grade anhydrous copper sulfate (vs. laboratory-grade), sodium

chloride (common cooking salt from the grocery), gloves, goggles, a mask if the copper powder is fine, bucket and wooden stirring stick for mixing, kettle to heat water.

Recipe
1 part anhydrous copper sulfate by volume
1 part sodium chloride by volume
8 parts hot water by volume

Steps

Wear gloves and goggles when working with powders; wear a mask with fine powders.

- Mix in a bucket equal parts of anhydrous copper sulfate and sodium chloride by volume.
- Mark the total height of the mixed powder.
- Add 4 times as much hot water as powder - further dilution slows etching.
- Stir well to dissolve powders in the hot water.

Disposal of Saline Sulfate Etch
Never put green-colored solution down the drain since copper is a pollutant to marine life. Spent etchant is transparent. It is a weak sulfuric acid so must be neutralized.

- To ensure all copper ions are drawn out, put zinc strips in the spent solution overnight.
- Neutralize the spent solution with sodium carbonate (i.e. soda ash or washing soda).
- Dilute with water.
- Run tap water while pouring the diluted, neutralized solution down the drain.

Note: Crystalline residue of copper sulfate and zinc oxide can be discarded as sludge in trash or dried and recycled by selling to a scrapyard or metal reclaimer.

Etch Zinc, Steel, Aluminum

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Metal Salt Etching

5. Acrylic Resists

Etching occurs where a plate is exposed to the etching solution. A resist, also called stop out or ground, protects other areas of the metal plate from etching in the etching solution. Traditional resists include asphaltum, which is addictive and toxic, and rosin dust, which is highly combustible, as grounds to resist etching and toxic polycyclic aromatic hydrocarbons (PAH) as cleaning and thinning solvents.

Nature of acrylics
When wet, acrylics are monomers, or unattached "globs" of plastic suspended in water. The monomers lock into each other to create tough polymers (examples of Dupont polymer chains, *left*) when they dry. Acrylics cure, or dry, more quickly with heat, which produces stronger bonds, but acrylics eventually dry and bond even without heat. Mixing acrylics together permits taking advantage of different qualities. The polymers created by drying mixed acrylics differ in appearance under high magnification, but all acrylic polymers are strong.

Acrylics as resists
Acrylics are preferred as resists for etching. They do not contain organic solvents, which are toxic. They are not easily absorbed into the skin and make no toxic fumes. Removal results merely in saponification. They have strong bonds so they do not easily disintegrate for big editions.

Effective acrylic resists include: Hunt's Screen Filler; Lascaux Screenprinting Paste 2049; Lascaux Acrylic Transparent Varnish 2060; Future Floor Polish; Graphic Chemical's Water-based Relief Inks - Black #1659 or Carnation Red; acrylic paints - pigments with acrylic as the binder; and ImagOn - the film polymerizes with light exposure as well as heat.

Working with Acrylic Resists

- Acrylics adhere better when metal plate surfaces are sanded and then degreased.
- Heat metal plates after applying acrylic resists to speed bonding of the monomers into polymers.
- Strip acrylics from plates by inserting the plates in a solution of sodium carbonate (1 sodium carbonate: 4 hot water) - the same stripping solution used for ImagOn plates. Most plates also require some scrubbing. Saponification turns the acrylic to soap, which can be flushed down the drain.

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Metal Salt Etching

6. Acrylic Soft Ground Resists

Soft Ground Resist
Soft grounds must be worked in a short period of time since they soon dry to become hard grounds. Soft grounds permit (1) imprinting of textures (such as lace, leaves, fabric) into the ground or (2) drawing through paper to produce a soft pencil-like line rather than the precise pen-like line characteristic of hard ground resists. The drawing or impression exposes affected areas of the plate but remains in place elsewhere on the plate.

Orono Acrylic Medium Resist and Texture Imprinting
Orono Acrylic Medium stays soft for approximately 20 minutes, during which time it permits transferring a drawing or imprinting of textures.

Materials and Equipment
Orono Acrylic Medium requires: a prepared and backed copper plate; degreased glass inking palette; medium nitril brayer or roller; spatula; Graphic Chemical's Water Soluble Carnation Red 1656 relief ink; Lascaux Arcrylic Transparent Varnish 2060; Lascaux Screenprinting Paste 2049. Texture imprinting requires: flat textural objects; plastic wrap; Pam; utility knife blade or tweezers for lifting objects.

Steps

- Lay out and blend with a spatula on the inking surface: 3 parts Graphic Chemical Carnation Red relief ink, 1 part Lascaux Acrylic Transparent Varnish 2060, 1 part Lascaux Screenprinting Paste 2049 (an acrylic) to make Orono soft ground medium. Place a tiny bead of Orono on the inking surface, and charge the brayer or roller (*top photo*).
- Roll over the plate, recharging as needed. The roll-out should cover the surface smoothly and quietly. Several thin layers are better than one thick layer. Vary roll out direction to reduce lap marks. Produce plate coverage of 80-90% so the copper barely shows through.
- Work quickly to position textured objects before the soft ground dries (approx. 20 minutes).
- Cover with plastic wrap sprayed lightly with Pam (*second photo*) and newsprint. Set press pressure one turn less than normal.
- Run through the press once. Carefully remove a corner of plastic wrap and gently lift an object (*third photo*); if no impression appears, increase the pressure slightly and run through the press again. Copper MUST be visible to etch!! The plate should show texture impressions and a thin layer of ink should show on objects.
- Carefully remove objects with blade or tweezers to preserve the exactness of impressions. Add hand-pressed textures at this point, such as a handprint or cardboard with 1 side removed (*bottom photo*). Heat dry on a hot plate for 1 hour. Etch according to standard procedures with aeration. Clean the roller with Dawn and cold water.

Graphic Chemical's Water Soluble Relief Inks and Imagery
Graphic Chemical's Water Soluble Relief inks can be used alone rather than as an ingredient for Orono Soft Ground Medium. They take 30+ minutes to dry (longer than Orono - an advantage for transferring a drawing). Orono, a true acrylic, is more durable than water-soluble relief inks, which can be reactivated by etching solution, so etch without aeration. Prefer Carnation Red #1656, which has more finely ground pigments than Black #1659. Avoid Daniel Smith's relief inks as they take a very long time to dry.

Materials and Equipment
Relief-ink Soft Ground requires: a prepared and backed copper plate; degreased glass inking palette; medium nitril brayer or roller; spatula; Graphic Chemical Water Soluble Carnation Red #1656 relief ink (*top photo*) or Black #1659. Soft ground imagery requires a drawing on a lightweight paper or newsprint and 2B, 4B & 6B graphite pencils.

Steps

- Spread a bead of water soluble relief ink on the inking palette with the spatula.
- Charge the roller. Avoid rolling out so much ink that a smacking sound is produced. The roll-out should cover the surface smoothly and quietly.
- Roll over the plate 2-3 times, recharging as needed. Several thin layers are better than one thick layer. Varying roll out direction reduces lap marks.
- Produce plate coverage of 80-90% so copper barely shows through. For multiple-plate printing, do not let any copper show through to maintain whites and roll out one plate at a time.
- Place the drawing or photo on the plate and quickly transfer the drawing to the plate with the pencils.
- Check the back of the plate periodically to be sure pencil marks are lifting soft ground. The *bottom photo* is the underside of the drawing with the lifted Black #1659 soft ground.
- Dry on a hot plate for at least one hour.
- Meanwhile, wash the brayer and spatula with Dawn in cool water; hot water sets the ink.
- Add a suspension handle and etch according to standard procedures. To avoid reactivating the ink, do not use the bubbler for aeration.

Hard and Soft Ground

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Metal Salt Etching

7. Acrylic Hard Ground Resists

Hard Ground Resist
Non-toxic acrylic replaces the distillate products associated with traditional hard ground etching. Future Floor Polish is the most effective and least expensive hard ground and the only hard ground that gives the characteristic crisp black lines on a print. Alternative hard grounds include any soft ground that has dried.

Materials and Equipment
Acrylic Hard Ground Resist requires: a prepared and backed copper plate; Future; India ink or black air brushing ink; tray to capture poured Future; funnel; mark making tools, such as a drypoint needle, nail, wire brush, scraper, knife edge, or wire pad, etc.; magnesium carbonate

Steps

- Future does not adhere well to an unsanded plate so this step is especially important.
- Add a small amount of black air brushing ink to the Future (India ink is shellac based).
- Pour Future over the top edge of a plate, as in the *top photo*.
- Drain on a paper towel for a few minutes and then prop the plate against the wall on a towel, as shown in the *middle right photo*; or dry the plate flat on a hot plate.
- When the Future is dry, cut through the hard ground to create the desired imagery, as in the *bottom photo*. Note: the longer Future dries, the harder it becomes and the more it tends to chip.
- Add a suspension handle and etch for 22+ minutes in aerated Edinburgh Etch.
- De-oxidize, rinse, pat dry, dry on a hot plate at Low for 20 minutes.
- Remove the handle. Print with the Future in place to proof the plate. If some areas need more etching, make more marks and/or add Crisco to protect areas for a second etching.
- Rinse, dry, de-oxidize, rinse, dry, heat dry on a hot plate at Low.
- Print. The plate has the brightest whites and deepest blacks with Future in place.
- Remove the ink with magnesium carbonate.
- Place the plate in sodium carbonate stripping solution (1 part sodium carbonate : 4 parts hot water) to remove the hard ground.
- Print again. The plate has plate tone in the non-etched areas.

Hard and Soft Ground

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Metal Salt Etching
8. Acrylic Aquatint Resists

Aquatint (from *aquafortis*, Latin for "strong water", and tinto, Italian for "tone") is a resist that permits producing an image solely with variations in tone (rather than with lines). Traditionally, a metal plate was dusted with tiny rosin particles and then heated to adhere the particles; acid etched the tiny exposed metal areas between the acid-resist particles. Spraying a fine mist of diluted acrylic on a metal plate with an airbrush produces a range of tones from white to velvety black without the dangers associated with rosin dust.

Set-up for Acrylic Aquatint Resist

Materials and equipment
Acrylic Aquatint requires: a prepared metal plate; an airbrush (*shown right*), such as Badger's Model 350, or Anthem Model 155; a silent air compressor with a reservoir for compressed air; a spray booth with ventilation (or wear a mask); a backboard support larger than the plate and covered with clean newsprint; a straight pin to pierce the airbrush if it clogs; a small container of soapy water; a liquid acrylic aquatint solution.

Recipes: Acrylic Aquatint Solution
The optional supplies for Acrylic Aquatint Solution are pictured (*right*). Both need to be diluted for use.

Diluted Hunt Speedball Screenfiller: Mix 1 part water to 2 parts Hunt Speedball Screenfiller in a small lidded container. This red solution makes a larger dot, is more difficult to see on the plate, and removes more easily. Work 12-18 inches from the plate with the airbrush nozzle slightly more open.

Diluted Badger Acrylic Aquatint Solution: Mix 1 part water to 1 part Badger Aquatint Spray in a small lidded container. This black solution makes a finer dot, is easier to see on the plate, but is difficult to remove from the plate. Work 18 inches from the plate with the airbrush nozzle just open enough to not constrict the flow.

Using an airbrush

- Work in a ventilated spray booth with the ventilation on (or wear a mask). See the set-up at the *right*.
- Prop the backboard against the back wall of the spray booth.
- Cover the backboard with clean newsprint to enable measuring the mist density.
- Prop the prepared and backed metal plate against the newsprint.
- Place a straight pin nearby in case it is needed to unclog the airbrush.

- Place a small container of soapy water nearby. After each use of the airbrush, insert it in the soapy water and depress the trigger/valve to prevent clogging, as shown (*right*). Whenever the airbrush is not in use, leave it in the soapy water.
- Shake the chosen acrylic aquatint solution well. Fill the glass jar with the solution.
- Attach the hose to the airbrush and the glass jar to the airbrush. If you do not leave the other end of the hose attached to the air compressor, attach it now.
- Plug in the air compressor and turn it on with the gauge set to 30 psi. The air compressor shown (*below*) is Sears 125 psi, 1.5 hp, with a 2 gallon reservoir.
- Check the spray on a scrap piece of newsprint placed in front of the metal plate.
- Spray with an even, side-to-side motion, moving slowly from top to bottom. Begin and end each stroke beyond the plate.
- Stop periodically to check the dot density on the plate and newsprint. When 40% - 60% coverage is reached, insert the airbrush in the soapy water and depress the trigger to blow bubbles.
- Lift the plate carefully out of the spray booth and lay it flat to dry on a hot plate for about 20 minutes.
- Clean the airbrush immediately to prevent clogging.

Cleaning the airbrush

- Return unused acrylic aquatint solution to its container.
- Wash the glass jar and lid in running water.
- Fill the glass jar with the soapy water and reattach the jar to the airbrush.
- Spray onto the newsprint until the jar is almost empty. Then turn the airbrush upside down and continue spraying until the jar is empty.
- Remove the glass jar and continue spraying air until no water comes out in the spray.

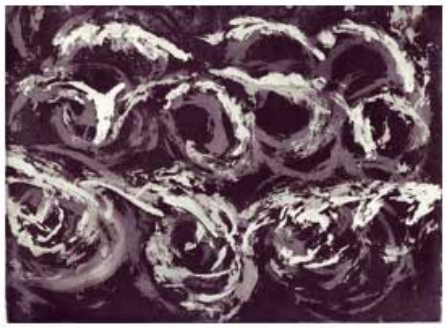
- Unplug the air compressor and release any water build up.
- Turn the ventilation off.
- Return all equipment to its proper storage.

Stage-biting Method

For Stage-biting, spray a single fine mist of liquid acrylic to cover approximately 40% of a metal plate. The dots of sprayed acrylic resist the metal salt etchant. Working conceptually from white to black, progressively cover areas of the plate with a resist (such as fat, screen filler or Future) and etch again. The longer an area remains exposed for etching, the deeper the etch and the darker the tone produced.

Materials and equipment
Acrylic Aquatint requires: a prepared metal plate; an airbrush, such as Badger's Model 350 or Anthem Model 155; a silent air compressor with a reservoir for compressed air; a spray booth with ventilation; a backboard support larger than the plate covered with clean newsprint; a straight pin to pierce the airbrush if it clogs; a small container of soapy water (10% ammonia); Hunt Speedball Screenfiller diluted 4 parts screenfiller to 1 part water as the acrylic aquatint solution; Crisco as a stop out.

Steps



- Prepare a copper plate for etching: sand with 600 grit wet/dry sandpaper and degrease.
- Back the plate with overlapping strips of packaging tape and apply a tape handle.
- Spray for a 40% coverage with medium dots; closer than that does not provide enough open space between dots for the blackest blacks. Spray only once! Normally heat dry for 20 minutes but fat cannot be heat dried so let the plate sit for an hour.
- Apply fat with a brush or finger to areas that are to remain white.
- Etch in Edinburgh Etch Solution for 30-40 seconds without the bubbler. Never use a bubbler with this process until the last etch as the sprayed resist is too delicate.
- Remove from etchant and submerge gently in a tray of tepid water to rinse. Pat dry.
- Apply fat to preserve light gray areas. Etch for 2 minutes. Rinse and dry as before.
- Apply fat to preserve slightly darker gray areas. Etch for 4 minutes. Rinse and dry as before.
- Apply fat to preserve even darker gray areas. Etch for 8 minutes. Rinse and dry as before.
- Continue in this manner. Finally, stop out all but the areas to be black.
- Etch in Edinburgh Etch solution to complete a total etching time of 40 minutes.
- De-oxidize. Wash with bonami and warm water to remove the fat stop out; rinse.
- Place in stripping solution to remove the acrylic aquatint resist.
- Wash, rinse, dry, heat dry on a hot plate. The print (*right*) was made using this method.

Single-biting Method

For a single etching, spray a single fine mist of liquid acrylic to cover approximately 40% of a metal plate. Let the plate dry, then block out areas to remain dark and spray again. The more an area is sprayed, the whiter it becomes. Stencils can be made from masking tape, frisket film or contact paper that has been pressed against cloth to reduce the stickiness. Objects can be laid on the plate and adhered temporarily with masking tape if they are lightweight.

Materials and equipment
Acrylic Aquatint requires: a prepared metal plate; an airbrush, such as Badger's Model 350 or Anthem Model 155; a silent air compressor with a reservoir for compressed air; a spray booth with ventilation; a backboard support larger than the plate covered with clean newsprint; a straight pin to pierce the airbrush if it clogs; a small container of soapy water (10% ammonia); Badger Acrylic Aquatint Solution diluted 1 : 1 with water; china marker, toothbrush, Hunt's Screenfiller; objects; toothbrush.

Steps

- Prepare a copper plate for etching: sand with 600 grit wet/dry sandpaper and degrease.
- Back the plate with overlapping strips of packaging tape and apply a tape handle.
- Spray for a 50% coverage with fine dots; closer than that does not provide enough open space between dots for the blackest blacks. Let the plate dry completely.
- Add stencils to protect areas that should be the darkest and spray again. Repeat as needed for the design.
- Make marks with a China marker, if desired.
- Dip objects in Hunt's Screenfiller, wipe on a sponge, and then apply, e.g., the ends of masking tape rolls. Screenfiller can also be flicked off a toothbrush for a dotted effect. Dry the plate on Low heat.
- Etch in Edinburgh Etch only once - for approximately 40 minutes. Never use a bubbler with this process until the last etch as the sprayed resist is too delicate.
- Remove from etchant and submerge gently in a tray of tepid water to rinse. Pat dry.
- De-oxidize. Wash with warm water to remove as much acrylic as possible.
- Badger Acrylic Aquatint Solution is especially difficult to remove, so strip it from the plate in a strong solution of sodium carbonate (1 part soda ash : 4 parts water by volume).
- Rinse, wash, rinse, pat dry, heat dry. The plate is ready to print.

Aquatint

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Metal Salt Etching

9. Pre-thinning Photo-emulsion Stencils

ImagOn photo-emulsion makes an effective stencil for photoetching. For bitmap, text, line art or halftone transparencies with resolution less than 120 ppi, the emulsion does not need to be thinned. Halftone transparencies with higher resolution require pre-thinning the photo-emulsion; without pre-thinning, the dots would be too close together to permit etching.

Materials and equipment
Pre-thinning requires: ImagOn supplies; a prepared copper plate; a halftone transparency printed with resolution higher between 120 and 1440 ppi; standard exposure equipment; standard developing chemistry; fresh developer (i.e., not previously used); talcum powder; etching materials.

Steps

- Laminate ImagOn-Ultra to a prepared copper plate and heat the plate to promote adhesion. Leave overnight.
- Develop the plate in clean, normal-strength developer; at the end of 7 minutes, wipe the surface with a paint carder.
- Rinse the plate in a tray of water rather than spraying water - this is gentler on the film.
- Rub vinegar to stop development - do not use the squeegee to remove vinegar; hand wipe it off.
- Pat dry; heat the film surface with a hair dryer to improve lamination.
- Rub talcum powder on the film to protect the transparency during the next step; remove excess talcum so only a light coating remains.
- Lay the emulsion side of the halftone transparency on the talc surface of ImagOn-Ultra.
- Expose about 25% - 30% less than the normal image exposure since pre-thinned emulsion does not require as much light to harden it.
- Develop for 2 minutes in regular-strength developer.
- Transfer the plate to clean half-strength developer. Rub gently with a sponge for an additional 30 seconds. Wipe off with a paint carder to remove any tiny bits of ImagOn-Ultra from the plate - they would impede etching.
- Rinse gently in a tray of water; spray vinegar; hand-wipe the vinegar off; pat dry; heat to stabilize the ImagOn-Ultra.
- Back the plate with shelf-liner or packing tape and make a tape handle.
- Etch for 2 minutes; remove and check for a brown color on the plate - a clue that the etchant is working. If the etchant on the plate is brown, etch for approximately 40 minutes, checking periodically.
- When etching is the desired depth, remove from the etchant. Rinse the plate.
- Sponge the plate gently with dish detergent. Rinse. Blot dry. Leave overnight.
- Make a few prints with the plate.
- Strip the ground from the plate in stripping solution.
- When all ground is stripped from the plate, rinse the plate. Blot dry. Heat dry for 15-20 minutes on Low.
- Print again. Note: prints with ImagOn in place will lack plate tone and print with more contrast.

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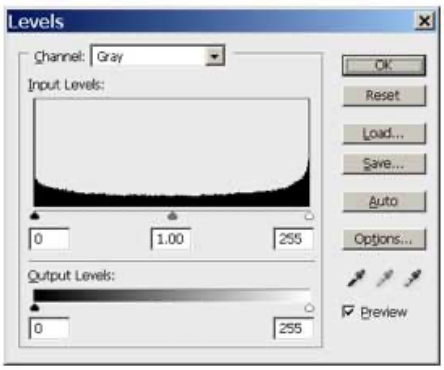
Metal Salt Etching

10. Photo-emulsion Text Stencils

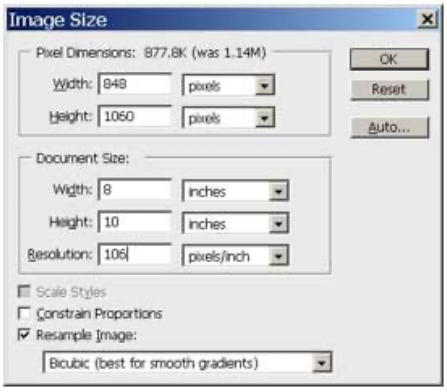
ImagOn photo-emulsion makes an effective stencil for photoetching. For bitmap, text, line art or halftone transparencies with resolution less than 120 ppi, the emulsion does not need to be thinned prior to exposure with a prepared transparency and an aquatint exposure is unnecessary.



Materials and equipment
Etching with photo-emulsion text stencils requires: ImagOn supplies; a prepared copper plate; a transparency printed with bitmap, text, line art or halftone image with resolution no higher than 120 ppi; standard exposure equipment; standard developing chemistry; fresh developer (i.e., not previously used); etching supplies.

Steps to prepare the text image

- Adjust Levels to strong contrast (*top photo*).
- Make the resolution less than 120 ppi (*second photo*).



- Choose a transparency that makes a hard dot and holds a lot of ink, as Azon 787N.
- Print the inkjet transparency with these settings, if available: Media Type: Ink Jet Back Light Film, Color: Black, Print Quality: Superfine 1440 (never higher than this), Halftoning: Error Diffusion, Microweave: On.

Steps for etching

- Lay the emulsion side of the halftone transparency on a prepared laminated ImagOn-Ultra plate. Make an image exposure as usual.
- Develop the ImagOn-Ultra plate for 9 minutes in clean, unused developer. Transfer to a second tray of clean developer. Wipe developer with a paint carder to remove any tiny bits of ImagOn from the plate that would impede etching.
- Rinse gently in a tray of water; spray vinegar; hand-wipe the vinegar off; pat dry; heat to stabilize the ImagOn-Ultra. Leave overnight.

- Back the plate with shelf-liner or packing tape and make a tape handle. Etch for 2 minutes; remove and check for a brown color - a clue that the etchant is working. If the etchant is brown, etch approximately 40 minutes, checking periodically.
- When etching is the desired depth, remove plate from etchant. Rinse the plate. Strip the ground from the plate in stripping solution. Rinse. Blot dry. Dry on a hot plate on Low.

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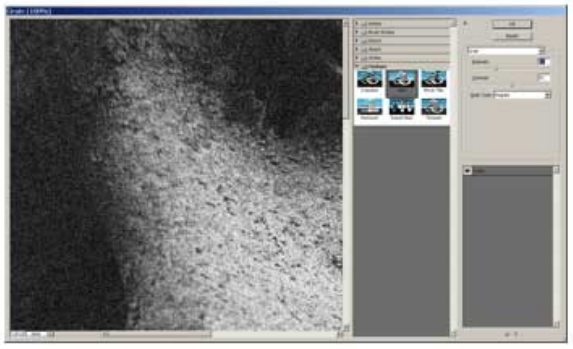
Metal Salt Etching

11. Photo-emulsion Bitmap Stencils

ImagOn photo-emulsion makes an effective stencil for photoetching. For bitmap, text, line art or halftone transparencies with resolution less than 120 ppi, the emulsion does not need to be thinned prior to exposure with a prepared transparency and an aquatint exposure is unnecessary.

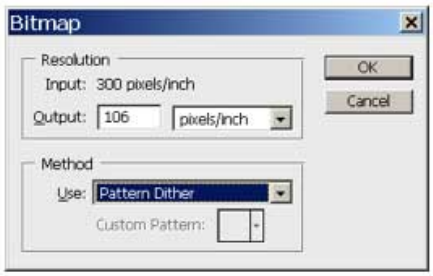


Materials and equipment
Etching with photo-emulsion text stencils requires: ImagOn supplies; a prepared copper plate; a transparency printed with a bitmap image with resolution no higher than 120 ppi; standard exposure equipment; standard developing chemistry; two trays of fresh, unused developer; etching supplies.

Prepare the bitmap image

- Increase contrast in increments (i.e., repeat step 4 times): Filter > Texture > Grain > Regular (*See top figure*).

- Convert to a bitmap image: Image > Mode > Bitmap > Method: Pattern Dither and Resolution Output 106 ppi (*See second figure*). Notes: Bitmap converts a tonal image to graphics so grays are translated as dots without any tonality; this increases contrast. Pattern dither is more random than halftone dither. Any resolution less than 120 ppi works.
- Choose a transparency that makes a hard dot and holds a lot of ink, as Azon 787N.
- Print the inkjet transparency with these settings, if available: Media Type: Ink Jet Back Light Film, Color: Black, Print Quality: Superfine 1440 (never higher than this), Halftoning: Error Diffusion, Microweave: On.



Steps for etching

- Lay the emulsion side of the halftone transparency on a prepared laminated ImagOn-Ultra plate. Make an image exposure as usual. Develop the ImagOn-Ultra plate for 9 minutes in clean, unused developer. Transfer to a second tray of clean developer. Sponge for 30 seconds, or until the plate has some areas without a blue tint. Wipe with a paint carder to remove bits of ImagOn from the plate that would impede etching. Rinse gently in a tray of water; place in a tray of clean vinegar; hand-wipe excess vinegar; pat dry; place on hot plate at Low for 30 minutes. Leave overnight.
- Back the plate and make a tape handle. Etch for 2 minutes; remove and check for brown color - a clue the etchant is working. Etch for approximately 30 minutes, checking periodically. When etching is desired depth, remove plate from etchant. Rinse. Remove the emulsion in stripping solution. Rinse. Blot dry. Dry on a hot plate on Low.

The brass plate (*right*) is the result of reworking. Open bite areas from the original etching required reworking with an acrylic aquatint resist. After the aquatint resist was dried on a hot plate for 1 hour, fat was painted on areas to be protected. The plate was etched another 20 minutes. Flat-black areas in the print resulted from the reworked aquatint etch; dotted areas resulted from the original photo-etch.

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