# ETCHING

## 12-15-07

## HISTORY AND TECHNIQUE




## INTRODUCTION

We will start with the basic modern process. From there we will move on to the hands on portion of the class and let you each create an etching. While the metal is etching we will look at the history of etching and some historic examples. To conclude the class we will return to the hands on activities when we remove your pieces from the etching solution, remove the resist and clean them up, giving you a piece to take home.

Each of you will leave here with:

- A completed etching
- A container with which to etch small pieces
- Materials needed to etch small pieces, including the etching solution used today



# BASIC MODERN PROCESS

# Basic Process

- Prepare the metal
- Apply resist
- Etch
- Remove resist and finish the piece



# Prepare the Metal

In order to start your project, you must first prepare the metal. You will need to:

- File the edges and sand the surface.
- Clean all of the oils, lacquers, etc. off of the face of the metal.

# File and Sand

Before you clean the metal, you need to remove any blemishes, scratches, burs or lips along the edge, etc.

You do this by using fine sandpaper (400-600 grit) and fine files. Use the files to remove any lip or bur along the edge of the metal where it was cut. Use the sandpaper to remove file marks and other blemishes from the surface of the metal. You need a good smooth surface to apply the resist to.



# Clean

Any metal you want to etch will need to be cleaned. This can be accomplished in many ways, but the easiest is to use powdered cleanser and steel wool or a cloth to scrub the metal until water sheets off on the entire surface of the metal rather than beading (forming drops.)

# Apply Resist

There are several types of resist that can be used for etching.

- Laser Printer Toner (Iron-on Resist)
- Paint/Varnish
- Asphaltum
- Photo Resist
- Wax
- Contact Paper
- Tape

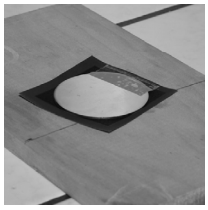


# Design Considerations

- Depth of etch desired v. width of lines. Due to undercutting, the deeper you want the etch, the wider the lines between etched areas need to be.

# Laser Printer Toner

Laser Toner can be used as an iron on resist. The toner is basically plastic. You print your pattern in reverse (mirrored) and then iron it onto the metal. One product that can be used for this is Press-n-Peal Blue (PnP). (Be sure to place a piece of paper between the iron and the PnP so the plastic doesn't melt to your iron.)





# Paint / Varnish

There are several uses for paint or varnish as a resist.

- You can paint your design onto the metal.
- You can use the paint to reinforce an iron-on or photo resist.

- You can paint the entire piece and then use a stylus to scratch your design through the paint.

## Paint / Varnish (cont.)

Paint also works well to coat the back of the piece and to seal the edges of any type of stick on material you might use as a resist on the back.

Acrylic paints, model enamels and fingernail polish are all good options.



## Asphaltum

Asphaltum is used the same way paint is used. It is more resistant to some etchants.

> 1. Mineral pitch, Jews' pitch, or compact native bitumen. It is brittle, of a black or brown color and high luster on a surface of fracture; it melts and burns when heated, leaving no residue. It occurs on the surface and shores of the Dead Sea, which is therefore called Asphaltites, or the Asphaltic Lake. It is found also in many parts of Asia, Europe, and America. See Bitumen. (from www.dictionary.com)

Per one manufacturer, this is removed with Naphtha. Some may be thinned with paint thinner or lacquer thinner.

# PHOTO RESIST

Photo resists are another option. There are liquid resists and film resists.

- Liquid resists are painted onto the metal and allowed to dry, in the dark.
- Dry film resists are applied to the metal directly. These are a lot less mess than the liquids, but are also more expensive.



# PHOTO RESIST (CONT.)

Both liquid and film photo resists come in Positive and Negative types.

- Positive Resist, the area exposed to light is removed when you develop the resist.
- Negative Resists, the resist that is not exposed is removed when it is developed.

# Wax

Wax is used similarly to paint. Wax is mentioned along with paint and varnish in the **Pirotechnia of Vannoccio Biringuccio**. The wax can be painted on in thin coats and then scratched away, painted on to protect a design or built up to provide a damn to contain the etchant.



# Contact Paper

Contact Paper is a good resist for large areas. The clear contact paper can be cut out in many shapes and applied to your piece. It also makes a very good resist for the back of your piece. Just seal the edges with paint or fold them over onto the front if you're not etching to the edge of the piece.

## Tape

Packing tape makes a very good resist for the back of small pieces. Use it as you would contact paper.

Automotive pin striping tape makes an excellent resist where you want uniform width lines.

With any type of tape, be sure to rub the edges down really well.

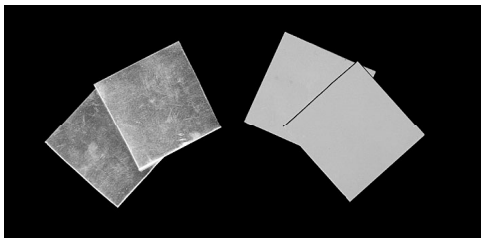


# Hands On

## Preparing Your Piece to Etch and Etching It

# Your Piece for the Class

For this class, you will have a piece of brass about 2” x 2”. I have already applied paint to the back to save time.





# Pick Your Method

You will get to choose the method you prefer for getting your design onto the brass so it can be etched.

- You can paint the design onto a piece that is bare metal on one side (you’ll need to clean the piece so the paint will stick)
- You can scratch your design through an already applied layer of paint.

## Get Your Design Onto the Metal

There are several ways to get your design onto the metal.

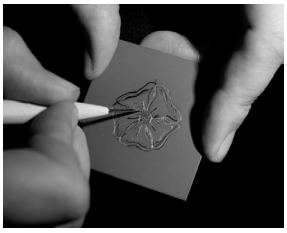
- Draw it on in pencil
- Trace it
- Pounce it (take a design, punch lots of holes in it, apply powder to the design when it's laying on the metal so you get dots through the holes and then connect the dots)



## Now What?

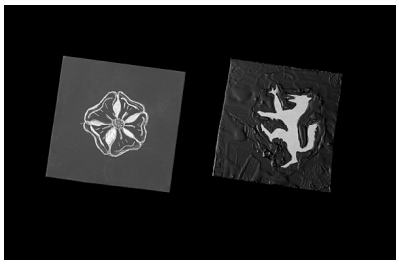
Now that you have the design drawn on the metal, now what?

- Either scratch the design through the paint using a stylus or paint it onto the metal. Be sure all of the metal you don't want to have etched is covered, including the edges.



## NOW WHAT? (CONT.)

- Let the paint dry. You can speed this up by baking it in a toaster oven at 150-200° F for 15-30 minutes.





## ETCH

We will now look at the etching process. This includes:

- Etchant
- Preparing the piece to be etched
- Etching the piece

# ETCHANT

Before we actually etch, you need to know a little about the materials we will be using to do the etching. I use a solution called the Edinburgh Etch. This is composed of 5 parts Ferric Chloride and 1 part Citric Acid solution. Mix the Citric Acid 100 grams to 100 ml of water (2 lbs 1 1/3 oz to 1 quart of water.) When the Edinburg Etch turns a deep olive green color it is no longer usable.

This solution lasts longer and bites cleaner than straight ferric chloride.

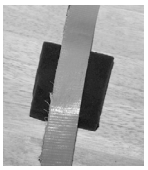


# PREPARING TO ETCH

Now that you have a piece with resist applied and an etchant solution, you need to get the prepared piece ready to etch. We will do this by taping the piece to foam rubber. We will use duct tape to hold the piece to the foam.

## Preparing to Etch (cont.)

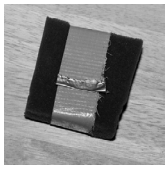
- Take a strip of tape and lay it over the foam. Be sure it is long enough to wrap around all the way and overlap on the back.
- Stick the piece to the tape.





## Preparing to Etch (cont.)

- If you aren't etching to the edge of your metal, use a couple of smaller pieces of tape to attach the metal firmly to the strip of duct tape.
- Wrap the tape around the foam and stick it together
- You are now ready to move on.



# ETCHING

You will float your piece, face down in the etching solution. This prevents the build up of precipitants on your piece which will block the etching process. How long it will take will depend on how deep you want the etch, how warm the solution is and whether or not the solution is agitated. I handle that by placing a glass baking dish on a warming plate and using an aquarium pump to bubble air to circulate the solution.



# ETCHING (CONT.)

You will be using a small storage container as an etching tank. This is a cheap, easily obtained alternative that works well for small pieces. This particular container will work well with about a pint of etching solution.

# HISTORY



## HISTORY OF ETCHING

- Aqua Regia and Aqua Fortis were discovered about 800 AD by Abu Musa Jabir ibn Hayyan.
  - Aqua Regia = 1 part Nitric Acid and 3 parts Hydrochloric Acid. It was called Aqua Regia because it will dissolve Silver and Gold.
  - Aqua Fortis = Nitric Acid. This will dissolve Silver.
  - I can find no record of the use of either for decorative work.

# History of Etching (cont.)

- 1431 Jehan Le Begue recorded two recipes for etchants.
  - To make a water which corrodes iron. Take 1 oz. of sal amoniac, 1 oz. of roche alum, 1 oz. sublimed silver, and 1 oz. of Roman vitriol, pound them well, take a glazed earthen vase, put into it equal parts of vinegar and water, then throw in the above-mentioned articles. Boil the whole until reduced to half a cup or a cup, apply it to such parts of the iron as you may wish to hollow or corrode, and the water will corrode them.
  - A water which corrodes iron, and takes away spots on all metals, and cleanses wounds. Take Roman vitriol and euphorbia, and distill them in an alembic. Then take the water which is distilled from them and apply it to the wound, and it will purify it and remove the dead flesh without great pain. If you write this on iron or any metal, the letters will immediately by made bitten into it.



# History of Etching (cont.)

- 1504 Leonardo da Vinci, folio 119 recto of Codex Madrid II.
  - Of how to cast this work in print. Coat the iron plate with white lead and eggs, then write on it lefthanded, scratching the ground. This done, you shall cover everything with a coat of varnish, that is, a varnish containing giallolino or red lead. Once dry, leave the plate to soak; the ground of the letters, written in the white lead and eggs, will be removed together with the minimum. As the minimum is frangible, it will break away, leaving the letters adhering to the copper plate. After this hollow out the ground in your own way, and the letters will stay in relief on a low ground. You may also blend the minimum with hard resin and apply it warm, as mentioned before, and it will be more frangible.

# History of Etching (cont.)

- 1540 Vannoccio Biringuccio, Pirotechnia.
  - Another secret is to make a sublime into rust, that is, with an acid made of sal amoniac, sublimate, verdigris, and a little nut gall in vinegar. After you have made your designs with a stylus (having previously applied a covering of varnish or wax to protect it where you do not wish the acid to lift away), smear your iron with these things and keep it thus for five or six hours, when all those designs will be found etched.



# History of Etching (cont.)

- The oldest item I have found in my research that is definitely described as being etched is the sword of King Sancho IV of Castile. It was buried with him in 1298. There is an etched inscription on the blade. "The decoration on the blade is so perished that it is not possible to elucidate the content, let alone the meaning, of the exquisitely etched lettering."

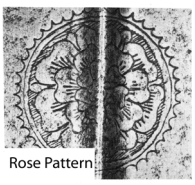
# History of Etching (cont.)

- 1325-1350 Sword with letters etched in the blade very similar to the Sancho IV sword.
- 1350-1375 Man of Sorrows. "The figure of Christ, beautifully described in a technique close to etching…"

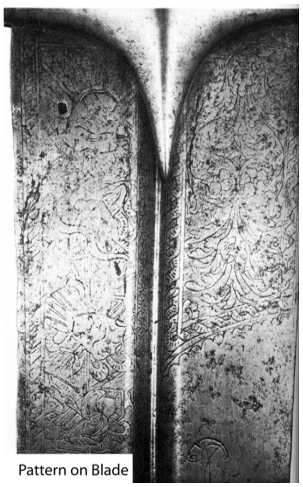


# History of Etching (cont.)

- 1480-1510 Sword with pattern etched on blade.
  - There is some fine etching, incorporation a heraldic Rose and a hunting-horn on the forte of the blade…



Rose Pattern



Pattern on Blade

# History of Etching (cont.)

- 1515-1518 The Cannon by Albert Durer.
  - One of the earliest surviving intaglio prints made from a plate that is known to be etched rather than being engraved.



# History of Etching (cont.)

- 1530 Left Quisse and Poleyn
  - This belonged to a member of the Trapp family and was made by Michael Witz the Younger of Insbruck about 1530. (Photos from "The Churburg Armoury, Carlo Paggiarino, Hans Prunner Editor)

# HANDS ON

## FINISHING YOUR PIECE



## FINISHING

Once your piece is done etching you need to do some finish work to it. The simplest finish is to use a brass wire brush with a little soap and water to brush off the resist and give the piece a nice brushed finish. This is the option we'll use for this class. (To make it easier, you can use a solvent such as acetone to remove the resist.)

## FINISHING (CONT.)

For a shinier finish you can sand the metal using a sanding block or putting the sand paper on a flat surface and sanding the piece with progressively finer grits of sand paper. Use wet or dry sand paper starting with 600 grit (if you have no blemishes to remove) And work up to at least 2000 grit, sanding wet. Sand with one grit until all of the scratches from the previous grit are removed. This will give a very nice hand finish.



## FINISHING (CONT.)

For a mirror type finish you can either continue with finer sand papers (these you need to get from jewelry supply houses) or use jeweler's polishing compounds and a buffing wheel (one for each grit of polish). Buff with each grit until the marks from the previous grit are gone.

# Historical Sources

- Biringuccio - The Pirotechnia of Vannoccio Biringuccio, Dover Books
- Hind, Arthur M. - A History of Engraving & Etching, Dover Books
- Smith, Cyril Stanley - A History of Metallography, The University of Chicago Press, Copyright 1960
- Oakeshott, Ewart - Records of the Medieval Sword, Boydell Press, Copyright 1991
- Paggiarino, Carlo and Pruner, Hans – The Churburg Armoury, www.hansprunner.com, Copyright 2006 (Photographs of the armour collection.)



# Web Links

in no particular order

- http://www.graphicchemical.com/ a source for chemicals
- http://www.igraver.com/pdf/image_transfer.pdf Article about the Edinburgh Etch
- http://www.polymetaal.nl/beguin/mape/edinburgh_etch.htm Edinburg Etch
- http://www.igraver.com/pdf/image_transfer.pdf Image transfer information
- http://www.alleycatscratch.com/lotr/makingem/Tips/Metal/EtchTips.htm Metal Etching Tips
- http://www.techniks.com/ Press-n-Peel
- http://homepage.usask.ca/~nis715/salt.html Using a safer mordant on Aluminum and Zinc
- http://www.hashbrownhaus.com/2006/03/22/press-n-peel/ Toner transfer resist etching
- http://www.diynetwork.com/diy/cr_metal/article/0,2025,DIY_13766_5351951,00.html DIY Network, Etching metal
- www.hansprunner.com Source for The Churburg Armoury
- www.dickblick.com Source for art supplies and items like asphaltum