The Jewelry Maker
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Introduction

1992
Welcome to jewelry! We all come to jewelry and metalsmithing in different ways. Some of us "just always wanted to take a course," some people have learned all they can about beading and want to learn about metalsmithing. Some have an affinity with metal and want to know how to bend and shape the stuff. Still others love jewelry, and want to be able to make their own. Whatever has brought you here, welcome and congratulations for taking the step!

Jewelry and metalsmithing are hard work, and also very rewarding. There is great pleasure in creating with one's hands, in the process of taking raw materials and creating something. It's also fun to get dirty, and to bang really loud on a piece of metal. It's wonderful to have someone say, "Gosh, I love your earrings," and being able to respond, "Thanks, I made them." So whatever brought you here, and whatever motivates you to stay, welcome, and let's get to work!

This book is a resource for you when you work on your own. The book is written as though you will be setting up your own workshop at home, so I discuss safety concerns, what type of tools to use, and how to set up your own area.
Good luck and have a great time!

2007
I wrote this book in 1992 and sold it as a photocopied-and-bound affair. I've decided to give it away as a free e-book on my website now. In order to update it, I've deleted sources that are no longer in business, and made a few other minor changes.

I could update it completely, and add color photos, but then it wouldn't be a free e-book would it?

For additional information, please visit my Squidoo Lenses and my blog, you can connect to both at www.CreativeTextureTools.com/news.

P.S. This book is copyrighted, please do not photocopy it. To share this book with others, just send them the web address that is on every page so that they can download their own copy. Thanks a lot for your help.

General Safety in the Jewelry Area

- Tie your hair back if you have long hair. If it's long in front, wear a headband. Don't wear loose clothes, scarves or open toed shoes.

- Never use a machine or chemical that you don't know how to use. Ask your teacher to show you how.

- Are you using a power tool? Wear safety glasses.

- Are you doing something that makes dust? Protect your face - your eyes, nose and mouth. Wear a dust mask and safety glasses

- Do you need to pick up something hot or get something out of an acid? Use tongs or tweezers. Not your hands!

- Did you spill acid? Put baking soda on the spill.

- Tired? Take a break, it could prevent an accident.

Resources

Usually, these are listed in the back of the book, but I've found my students are pretty anxious to go shopping by the time they get to class. This is a partial list. To find more sources, check the backs of other books, and look at magazines for ads. Then write for lots of catalogs! Catalogs make for great reading, you can learn a lot from them. For instance, Rio Grande's catalog includes "Rio Tips" which give pointers on how to use certain tools or parts. Catalogs are also educational because you can learn from them what's available for jewelry making. Magazines to check for ads of suppliers: The Craft Report, American Craft, and Ornament. All are available on the new stand.

Suppliers

Rio Grande Albuquerque
1-800-545-6566
Albuquerque, NM
www.riogrande.com

tools and supplies, gems and findings, packaging and display, PMC

Contennti
www.contenti.com

Tools and equipment, a specialist in lower priced items.

CreativeTextureTools
River Forest, Illinois
www.CreativeTextureTools.com

Hard to Find Tools for Metal Clay. Silicone Texture Plates, Photopolymer Texture Plates and more.

American Science Center
Chicago, IL
www.sciplus.com

Found objects, non precious sheet metal, wire and tubing, motors, plexi, assorted surplus.

Gemological Institute of America -- GIA Bookstore Catalog
www.gia.edu
large catalog of books, audio tapes, posters, on the subjects of jewelry and gemology.

Want more sources? (of course you do!) Network with your jewelry making buddies, they'll tell you their favorite sources. Buy copies of jewelry and craft magazines and write requests for catalogs to their advertisers. Ornament and American Craft magazines are available in bookstores. Pages in the backs of jewelry books frequently contain lists of suppliers.

Chapter 1 Sawing and Finishing

Using the jewelers saw

The jewelers saw is your friend. It took me over a year to get to be friends with my saw. I would do anything to avoid sawing; I would use the bench shears, tin snips. The result of my using other tools and avoiding the saw was that I didn't come into my true designs for years; I only did pieces with straight lines that could be cut with snips. Part of the reason it took me so long to like sawing was that my first saw frame was a cheap one. It was crummy. Lesson for you: Buy the best frame you can afford (German made ones have the best reputation) and make it your friend. Saw frames last years -- remember that when you consider your purchase.

Beginning to Saw

What to have at your work space:

saw frame
sawing "V"
saw blades
beeswax or other type of blade lubricant
pliers (optional)
scrap metal (or non-precious metal)

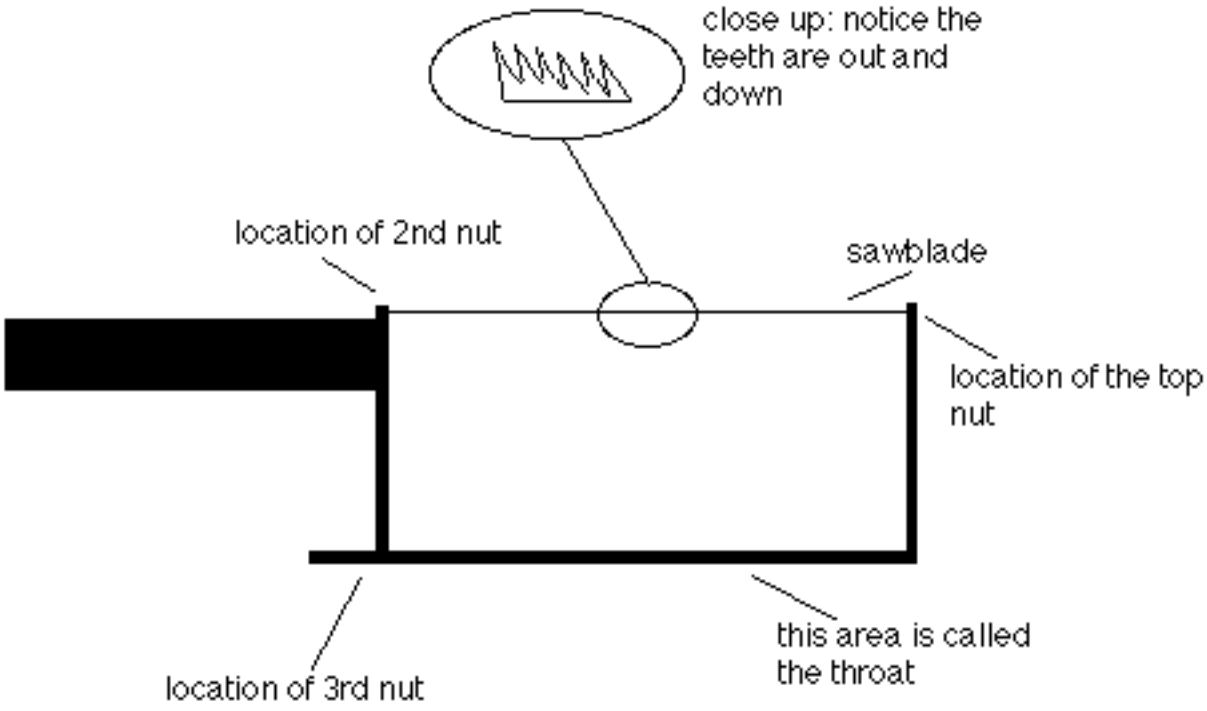
Preparation to sawing

The preparation for this exercise is have determined where you will work, cleaned the area you've selected so you have ample room, and gathered your supplies and set up the sawing "V." You can buy or make your own sawing "V," which is basically a piece of wood with a "V" cut out of it, preferably with a circle cut out at the point of the "V," and it is screwed on to the table with a "C" clamp or similar item. (Available at a jewelry supply house.) To make your own, look at one in a catalog to see what they look like, cut a "V" out of an appropriate size rectangle of wood and buy a "C" clamp to go with it.

Now you're set. Place the "V" in front of you on the table where you will be working. Place the "C" clamp or other mechanism (varies with purchased ones) and tighten until "V" does not move easily when pushed to test.

Step one - getting a saw blade

Saw blades always come by the dozen, wrapped together by a wire. Take a saw blade out of the bundle by unwrapping the wire until the blades are not so tightly bundled together. Pull out a blade with your fingers or the pliers. (You may want to use the pliers to unwrap the wire.)



Step two - inserting the saw blade

Now you've got your blade. Hold it between your thumb and forefinger and look at it. You want the little tiny teeth to be pointing OUT and DOWN. This can be very hard to see, to deal with this, you may want to get magnification. Also helpful is to hold the blade up to a light source. Another option is to feel the blade with your finger to determine the direction of the teeth.

Turn to your saw frame and hold it (maybe in your lap, maybe in your hands) so that the throat (see diagram) is facing up. The bottom part of the "U" shaped part should be on the table, meaning that the handle is up in the air by comparison. Great! You've got it in position. Now make sure that the lower "nut," the one closest to your body, is open just a little. Insert the blade into the flat washer there and tighten it, making sure that the blade is still in the out and down position. We're halfway there!

Now make sure that the top nut is open a little. Place the frame up against the edge of the table and lean into the handle with your shoulder. As you are applying this pressure, use your hands to insert the blade and tighten the nut.

Checking and trouble shooting

Now see if the blade is tight enough. Push on the blade with a finger to test (on the back, not on the front where the teeth are). The blade should stay taut. The blade should be *very* tight; if it gives at finger pressure at all it is too loose. If you find yours is too loose, just repeat above steps, this time pressing harder. Another possibility is that the third nut on the frame needs adjusting. This is the nut that makes the frame longer or shorter. A too loose blade could be resulting from a frame which is set too short for the blade (*i.e.* the blade is too long for the frame, and thus cannot get tight). If this is what happened, first loosen the top nut, then adjust the third nut so that the frame is longer. Then repeat the steps for inserting the blade into the top nut.

Step three: beginning to saw

Choose the piece of scrap metal you are going to practice on. Apply lubricant to your blade by rubbing the wax up and down your blade a couple of times. Now you are ready to make your first cut. Hold the metal on top of the "V" with your non-dominant hand so that the place on the metal where you will saw in over the "V" part of the sawing "V." Take your saw, hold the handle with your dominant hand (with your wrist relaxed) and hold the frame so that the blade is facing and perpendicular to the metal. To start the cut: place a fingernail of your non-dominant hand at the point where you want to cut, put the blade at the point and make one quick stroke DOWNWARD. This should give you enough of a "bite" in the metal that the blade will stay in that groove as you continue. Now put your non-dominant hand back supporting or holding the metal. Put the blade in the groove you started. With a relaxed wrist, move the saw frame up and down, keeping the frame VERTICAL. (Do not slant forward, check yourself frequently to see that this has not happened.) The blade only cuts on the down stroke, the upstroke is just to get the blade back to the starting point. You're sawing!! Just saw around for a while, do shapes and lines.

Tip: to save time and energy, start your sawing at the point at which your design in closest to the edge, and saw toward that.

How to turn the saw

To turn your blade, keep moving the blade up and down and then turn the blade and the whole frame the direction you want to turn and continue moving it up and down. That's it! For a hard turn, do this sharply. To make a rounded curve or more subtle curve, turn the saw more gradually.

How to pierce

Piercing is the term used to describe internal cuts on a piece which do not originate from an edge. Usually done for decoration. To do this you drill a hole in the metal, insert the saw blade through it (the saw blade should already be inserted and tightened in the bottom nut), and then insert the blade into the top nut and tighten.

Tip: to prevent the blade from breaking, before you tighten the blade, move the metal all the way down to the bottom of the saw blade where it can rest on the frame.

If you are going to lubricate the saw (with beeswax or Burr Life), go ahead and do it, and now saw as you normally would. Repeat this action as many times as necessary to complete the design. Drill the hole as closely to the spot where you want to saw as possible -- this is more efficient. See the next chapter for instructions on drilling.

Philosophical thoughts on sawing

My choir director used to say that the best thing for a singer was to be like a "slack jawed idiot," because then the jaw would nice and relaxed for singing. The same is true for sawing -- only with your wrist. Your wrist should be relaxed. When you saw you are not getting it done by forcing the blade through the metal, rather, your relaxed wrist is just the vehicle for the blade's repeatedly going up and down. Sawing is like sailing: you can use your sails to make your little boat go where you want on the great and dangerous ocean, but you can never control the ocean. Same for sawing, if you trying to control it, you lose because the blade breaks and you have to begin again. But if you realize that your saw is just a boat, and you can control only WHERE you go, then you're okay, you're in harmony. Dance with the ocean. Sawing is a trip, not a destination. If you do this you will saw better. You may also want to try soothing music.

Using patterns for sawing

Patterns are a picture on paper which you affix to your metal to assist you in sawing. (I use them all the time.) Patterns can be anything: a leaf you photocopied, a drawing of your own, a picture from a copyright-free book, a shape drawn with a template, anything. Photocopying is usually a step in pattern making; sometimes the reason is to preserve the original. If you will be making a number of items, you can use a pattern to lay out your designs in the most efficient way for your piece of metal. (I take my photocopies of my designs, cut them out and arrange them how I want, tape them down and then photocopy again.)

Next you'll glue your pattern to your metal. Spray glue from an art store works well (usually), but is incredibly difficult to remove. Regular white glue doesn't stick as well, but comes off really easily when you are done and want it to come off. White glue doesn't last long either -- if you stop work for a day or two when you come back the pattern won't be affixed any more. (So, it's up to you -- there are the pros and cons.)

Using patterns is optional. You may prefer to work freeform, I do for some applications. I like patterns because they have repeatability (important for earrings) and successful designs can be done in multiples. Also I've found that my designs have a different look depending on whether they were done freeform or from a pattern.

Chapter 2 Drilling

Drilling

Drilling is a technique for creating holes in metal and can be done with a hand drill or a power drill such as a drill press or a flexible shaft machine. Holes are useful for attaching jump rings, inserting tubing for rivets, or as an entry point for internal piercing (sawing) of metal.

What to have at your work space:

hand or power drill
drill bit(s)
steel block
center punch (or nail)
hammer or mallet
lubricant (wax or oil)

Step one: preparing the metal

Before you can drill, you must prepare your tools and your metal. For the metal, decide where the hole or holes will go and mark the area with a pen or by scratching the metal with a sharp pointed object. If the item is a pair, ensure that the holes are in the same place on each item. Once the items are marked, the next thing to do it to stamp the place to be drilled with a center punch, or if you don't have one, a nail will do. Place the metal work piece on the steel block. Hold the metal in place *and* hold the center punch with your non-dominant hand. Use your dominant hand to hold the hammer and struck the center punch firmly once. The metal should now have a small indentation at the point you marked. The purpose of this indentation is to make the drilling neater. This indentation will help guide the drill bit to the desired place, otherwise the bit has a tendency to wander around on the metal before finally coming to rest where you want it. Then you have to remove the undesired marks caused by the drill bit.

Step two: drilling

Now prepare your hand or power drill. The first thing to do is select your drill bit. If you will be inserting a jump ring or other wire through the hole, then determine what size drill bit to use by placing the cutting end of the drill bit end to end with the wire you intend to use. The bit should be just slightly bigger than the wire; if they were exactly the same size then there would be a tight fit when you tried to insert the wire through the hole. If you are drilling a hole so that you can pierce (saw out part of the

inside of a piece of metal without sawing in from the edges) it, then the bit should be as small as possible, but still big enough for the blade to fit through.

Once you have the bit selected, insert it into your drill. For most drills this means using a chuck key to open the three jaws of the chuck (the thing which holds the drill bit in place), inserting the bit and holding it in place while closing the jaws of the chuck using the chuck key. (This goes for hand and power drills.) Now lubricate the bit in one of two ways: place a dab of oil on it, or turn on the drill (turn the crank if it's a hand drill) and insert the bit into solid lubricant such as beeswax. This is done so that the drilling will go better and so that the drill will last longer. Once the drill is inserted, test it to see that it is held tightly in the chuck by turning on the motor and watching the bit turn. If you see the bit turn in a small circle, it is loose and will not drill properly. Loosen the chuck and begin again.

Note: Do not point the drill bit at your eyes when you look at it! Hold it at arm's length, parallel to your body. And wear SAFETY GOGGLES!

Now you are ready; the metal has been "punched," the drill bit selected, inserted and lubricated. To drill, place your metal on top of scrap wood (or accept that your table top is about to have a hole in it!), hold the metal still and, with the drill bit turning, press down on the drill so that the drill bit goes through the metal, and while the drill bit is still turning, remove the drill bit.

Drilling variations depending on type of drill used

Drill Press

This is a lovely accessory, you can use it to turn your flexshaft (permanently or temporarily) into a drill press by purchasing an accessory. A drill press is basically a mounted motor with the chuck in an upright position so that it will always be perpendicular (_|__) to the metal being drilled. The drilling action takes place when you lower a lever, which causes the drill bit to move down and through your metal. There is no need for wood underneath your piece in this case, because it is already placed on a raised stand. Before using the drill press, test it with the motor off to see that the bit will go through the hole in the raised stand and not hit the stand itself.

Flexible shaft machine

In this case we are talking about a flex shaft not mounted in a drill press. To use this, follow the directions as above. Specific instructions for the flex shaft are to hold the metal in your non-dominant hand and to hold the flex shaft hand piece in your dominant hand. Hold the hand piece in an upright, vertical position, with no slant at all. Then, while pressing down on the foot pedal, lower the drill bit into and through the metal, and then back out again. Some people like to extend their pinkie finger (of the hand which is holding the hand piece) to the table to stabilize their hand. This technique requires some hand strength, and some people find it difficult or uncomfortable. If you have many drillings to do, pause every 20 minutes or so and give your hand a rest (this helps prevent carpel tunnel syndrome!).

Hand drill

The hand drill is the most affordable type of drill, and is preferred in some situations even when a power drill is available. It works by turning a crank clockwise. The chuck in some hand drills does not use a chuck key, but is tightened by twisting the housing which is just above the chuck. The extra challenge in using a hand drill is that you must hold your metal in place with one hand and still be able to hold the drill upright *and* turn the crank and the same time. You may want to get a friend to help. Another option is to use a "C" clamp to hold the metal in place; if you do this be sure to cover the metal and/or the clamp with making tape so that your metal is not marred too badly.

Chapter 3 Filing and Sanding

Filing

File to remove burs, or to "fix" sawing that didn't go right, such as a circle with some extra stuff on it. You would file that off and your circle gets more circular. When filing, remember to use a forward stroke. The cutting happens on the "away from your body" stroke.

Special files are available for most any application. "Riffle files" are bent at the ends. "Needle files" are small ones in assorted shapes (triangular, circular, square, etc.). Those types of files are usually bought in sets. Larger ones are purchased singly. If that's not enough variety for you, they also make bendable files, that you bend to your needs! Files come in various degrees of coarseness. Some have "cutting" faces on the edges, some don't, some have cutting faces front and back, some on just one side. Observe the file you are thinking about using and ask yourself, "is this going to cut anywhere I don't want it to?" It's also a good idea to test the file on scrap to see what it does.

You can file holding your metal in your hand on your sawing "V" or you can place the metal in a vise. If you put it in a vise, protect your work piece from the teeth of the vise by buying rubber protectors for the vise or tapping them, or covering them with paper. It's easier to saw precisely than to fix sawing mistakes later by filing. Read catalogs to determine what kind of files to buy. Use varying degrees of pressure to achieve your needs. Check frequently to make sure you don't go too far with your filing.

Sanding

Sanding is the first step in "finishing" your piece. (If you are going to solder, you may not need to do this yet.) Sandpaper for metal is black and is usually called "wet/dry" sandpaper. Jewelry supply catalogs also offer "emery paper," but for most jewelry making, sandpaper from the local hardware store is fine. The paper comes in various "grits," or coarseness. They are 240, 320, 400, 600. (There are more, but these are enough for our purposes.) The higher the number, the finer the grit, so the above are listed from coarsest to finest. You don't always have to use all five grits. You make a decision on where to start based on the condition of your metal. If it's really scratched up and looks just awful (because of what you've done to it or because it was like that when you got it) then you'll start with a lower number. It's a good idea to test it on scrap to get an idea of the coarseness until you get a feel for the different grits.

When you sand, you sand your piece in one direction only (think of it as from head to toe), then when you move to the next grit, you do in the opposite direction (this could be shoulder to shoulder). Some people sand by holding the sandpaper in their fingers. The drawback to this is that at your fingertips, there will be kind of a rut cut into the metal, and tiny hills where the in between part of your fingers were. To prevent this, you can wrap sandpaper around a file of the size appropriate to your work. You could also use a paint stirring stick. Tape the sandpaper in place. If you use a file, be careful, because sometimes the paper slips and the top of the file is exposed and can cut your metal, and sometimes the paper wears through.

The question everybody want to know the answer to is, "When am I done sanding?" And the answer is, "It depends." Consider what you are going to do next with the piece. Are you going to solder? Polish? Usually students ask this because they are tired, and they want to stop, though secretly they know they're not done yet. You'll be able to tell.

Chapter 4 Connections: Hot and Cold

Making and Using Jump Rings

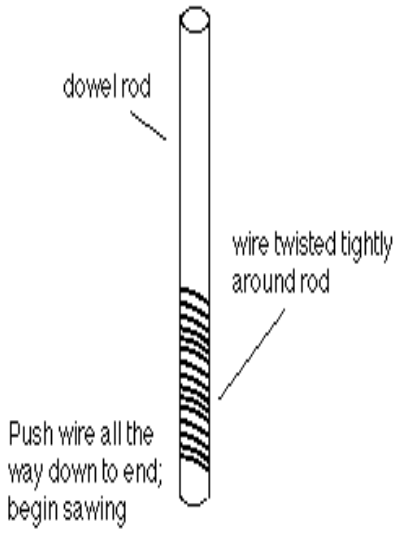
What to have at your work space:
dowel rod OR "round - round" pliers
saw frame and blades
sawing "V"
wire

A jump ring is a circle of wire with an opening. You've probably seen these on your own necklaces -- it's the thing which connects the chain and the clasp. Because jump rings connect items without soldering, without heat, they are a "cold connection." Here's an overview: to make jump rings, you create a thing which looks like a spring out of wire, and then you cut it so that each spiral of the spring becomes a jump ring.

Step one: making the spiral or spring

There are two ways to do make the spiral or spring. One is to use round - round pliers (available through jewelry supply stores). Take a length of wire and place one end of it in between the jaws of the pliers, then twist the pliers and form circles in the wire. The pliers are tapered, so be careful that your circles are being formed at the same point of the pliers, because you want your jump rings to be uniform in size. At some point you may want to take the spiral off, flip it over and continue (this presumes there is wire available at that end). Wrap the wire tightly, so that each consecutive ring of the spring is touching.

A second method uses dowel rod. Purchase dowel rod at a hobby, craft or fabric store. You will probably want to break it to make it a more manageable length. Wrap the wire tightly around an end of the rod, again making the consecutive rings touch each other. Make your spiral as long or as short as you want.



Step two: cutting the rings

If using the dowel rod, place the rod against your sawing "V" and start sawing with your saw. There are two ways to cut: either cut straight across all the rings at the same time, or cut off one ring at a time.

If using the pliers method, just hold the spiral against the "V" in your hand as best you can, and then saw.

Careful not to loose the rings as you complete them. Watch where they go and pick them up as you go along.

Step three: using the rings

To open a jump ring, use two pairs of pliers, preferably pliers without teeth. If you only have one pair of pliers, you can use them along with a pair of tweezers. Hold one side of the jump ring with one pair of pliers, with the opening, or the place where the ring meets, pointing up. Usually this means you will hold the ring's left side with your left hand if you are right handed (If you are using tweezers, this is where you use them). Now, holding the second pair of pliers in your right or dominant hand, grasp the ring's right side and twist the ring away from you. Now you should have a ring which is open, but still circular. Attach whatever you want on the ring on it, and then close it, doing just the opposite of what you did before. Hold it just the same way as before, and now bring the half of the ring toward you.

Note: your jump rings may need to be burnished, if your jump rings seem soft, and like they won't hold, jump ahead and peek at chapter 2 and the section on burnishing.

Another type of cold connection is the rivet. Consult The Complete Metalsmith by Tim McCrieght for details.

Torch safety

- Concentrate.
- Tie long hair back. Don't wear loose clothing.
- Before you start, check the area. Look for paper, towels, flammables such as aerosols, glues, paint thinner. If you find any, move them!
- When you're done, double check that you've turned the torch off. Bleed the line if you're going to be the last one to use the torch in a group use studio, or if it's your torch and you're quitting for a while.
- Use only the right pickle for the right metal. Use copper or bamboo tongs in the pickle, never stainless steel.

Soldering area

What to have at your work space:
ceramic pad
charcoal or magnesia block
tripod (optional)
steel "T" pins
torch
solder
flux

Well, to state the obvious, soldering involves fire, and is therefore potentially dangerous. The first safety step is to prepare your area. You will do your actual soldering on top of the charcoal or magnesia blocks, but these do not offer enough heat protection alone. In fact, the charcoal heats up and can actually increase danger. For those reasons, use a ceramic pad (they come in assorted sizes up to about one foot square) underneath your block. So your set up will look like this: ceramic pad on table, magnesia (or charcoal) block on top of pad, piece to be soldered on top of block. This is adequate protection because the flame is usually small. The trick is to keep the flame in this area. If this does not seem adequate to you, cover your entire soldering area with fire bricks (from pottery supply source) or ceramic tile. Another option is to buy an annealing pan, which is a large flat bottomed bowl which rotates and is traditionally filled with crushed pumice.

Another safety aspect to consider is fumes from the torch gas. The best option is a ventilation system. Failing that, have windows and doors open or solder outside. You may wish to use fans to exhaust the fumes. With fans and windows, make sure that the fumes are leaving, and not being blown back into your face. You may elect to wear a respirator mask -- the kind which covers your mouth and nose and has replaceable filters. For more on this subject, consult Ventilation: A Practical Guide for Artists, Craftspeople, and Others in the Arts, by Clark, Cutter and McGrane.

Soldering: butt, sweat, and findings

Okay, now you're ready, you've got a torch, your area is set up safely and you've got something to solder. First, some definitions. Butt soldering is when you solder two ends together, such as the two ends of a ring. Sweat soldering, also called appliqué, is when you solder one piece on top of another. Usually the pieces are of different sizes. The last type of soldering is when you solder a "finding," such as a pin catch or earring post to a piece.

Soldering is the process of heating two pieces (usually) of metal with a substance between them (solder) , connecting them upon melting. Just think of solder as having a "glue-like" function. So the first step is getting the "glue," the solder into place.

Everything you wanted to know about solder but didn't know who to ask

In the big picture, there are two types of soldering: hard and soft. Soft soldering requires a very low temperature. We will be talking only about hard soldering (higher temperature). Within the category of hard soldering there are the following types of solder:

IT (super hard)
hard
medium
easy
super easy

These are listed from highest melting point to lowest melting point. For most purposes, the middle three (hard, medium, easy) are sufficient. Having a variety of solders allows you to make a number of solder joints in an item without the previous ones coming undone upon reheating. So if you have three solder joints in a piece, you would use hard the first time, medium the second and easy for the third. You choose by looking at how many solderings you have to do. Hard solder requires high temperatures and is not always necessary. So if you had a piece with two solderings you could use medium and easy, avoiding hard altogether.

Solder comes in sheets, wire, and paste. Paste is most appropriate for production situations where a large number of similar items are to be made. Sheet vs. wire is mostly a

matter of personal preference. Sheet solder works best for sweat soldering, where flatness is important. Wire solder is easily confused with sterling wire. Sheet solder can be written on to denote what it is. (In fact, doing so is incredibly important.) You must keep all your solders clearly marked and separate from each other. Small flat tins are ideal, small butter tubs are okay if that's all you have.

In the big picture there are three types of solder: tin, silver and gold. Tin solder is the kind used for stained glass and electronics. For craft purposes it is awful, it's messy and blobby and horrid. Worst of all, it eats holes in silver. Avoid it. Gold solder is for gold. Silver solder is for silver, brass, and copper. Aluminum, titanium and niobium cannot be soldered, at least by the techniques we are discussing. For our discussions, we will talk about silver sheet solder.

Step one: placing the solder

To place to the solder, first cut it up. For sheet solder, create solder chips by cutting into the solder into vertical strips (about half and inch) using tin snips or scissors. Then, cut horizontally to get chips. The size of your cuts in both directions will determine the size of the chips. A variety of different size chips is usually helpful. Cut carefully so that the chips fall into a container which is marked with the type of solder that it is.

Before placing the solder chips on your piece, you must first prepare your piece by cleaning it and coating it with flux. Flux helps the solder flow and prevents oxides from forming on the metal. (Flux comes in liquid or paste.) Flux also helps stick your solder chips to the piece. You can use a tiny paintbrush or tweezers to place chips, choose the method that feels best to you. (I used to swear by the tweezer method, I've since switched to a paintbrush and now the tweezers feel funny.)

The two methods, paintbrush or tweezers are basically the same: pick up a solder chip with your implement, cause the chip to become covered with flux, and place the chip where you want it. When using the paintbrush method, dip the brush in the flux and then pick up the chip and place it. With the tweezers, you pick the chip up, dip in a little puddle of flux and place it. The tweezer method keeps your solder container clean.

How much solder is enough? Too much creates a mess you have to clean up later; too little and the job doesn't get done. You will learn with practice. For soldering findings, usually one chip is enough. When sweat soldering (see glossary), the piece should be evenly covered. (For sweat soldering, you cover the smaller piece or the piece with cut outs in it, let it dry, then flip it over and put the piece on the other piece you want to solder it to.)

Step two: turning on the torch

Follow the directions that came with the torch. Light it using a flint type starter, not a match or a lighter. Adjust the flame to a size appropriate to your piece; if your piece is small, your flame will be small, etc. Check that there is not "extra" flame oozing out near the tip of the torch tip, that's undesirable. Also check that the flame's inner blue cone is blue, and does not have any white or yellow at the end. I solder with the lights off, it's easier to see the flame and the colors the metal turns.

Step three: Soldering!

Okay, you've picked the type of solder, and you've placed it, your piece is clean, fluxed and sitting on a fire safe thing, your torch is on and the flame is the right size. Now you're ready to solder!

Begin by circling the piece slowly and evenly with the flame, which is at a 90 degree angle to the piece (perpendicular (_|_)). The reason for this is that if you put the flame directly on the piece it "shocks" it and the solder chips jump off. So you ease into it, circle the piece, which heats up the block underneath. Flame is not to close, not too far. Now move onto the piece, still moving in circles. The key is to keep the entire piece hot. If there's a little skinny part off to one edge, you have to keep that hot too. Solder "flows" (melts) when the both pieces of metal are equally hot and the solder is at the temperature at which it flows. So that's why you can't let any part of a piece get cold. Keep doing this -- circling the piece, even heating, not letting anything get cold, until the solder flows.
When the flux begins to burn off you will see a green glow or light which may appear to be part of the flame. Again, this is easier to see in lower light. This is a hint that the metal is getting hot, that you're getting there. When the solder flows you may see a silver flash, or may notice that you don't see chips any more.

When soldering you don't want the piece to turn "cherry red." That means the piece is too hot, possibly beyond the point where it would solder. (There are always exceptions, sometimes it seems like the piece will only solder when it's this hot, and if that's the case, of course go ahead and do it. In general, though it is not desirable.)

That's the whole trick. Heat it till it melts. Soldering is hard. You can do everything right and it still might not happen. It's a skill you need to develop, and you will improve with practice. Just accept that you are learning something new. You may have to start all over with your piece -- washing and re-placing the solder a number of times.

Clean, fluxed and touching!

This is the motto for soldering, my teacher Allison Young said it. It refers to the desired condition of the metal for optimum soldering.

Bonus section -- special soldering toys

The steel "T" pins are used to hold stuff in place as you solder. Be careful not to solder the pins to your work. Remember not to touch the pins to remove them when you're done -- use tweezers. Pins work with soft things, such as magnesia blocks. Charcoal is too hard.
Alligator clips and tweezers on a "third hand" stand can be very helpful. The alligator clip type third hand is available at your local electronics supply store.

A tripod with a piece of screen across the top is used when you need to be able to heat something from below. This method is used when you are soldering a very small piece to a very large piece. You heat the bigger piece first from below, thereby preventing the smaller piece from melting.

Pickle

What to have at your work space:
copper or bamboo tongs
covered glass containers
manufacturer's pickle (you will mix it)
labels for containers

Pickle is the trade name for a number of mild acids that are used after soldering to remove the oxidation from metals. (Oxidation forms during soldering.) Oxides are a "skin" and as such can be removed from the surface. Oxide on sterling and fine silvers is called "fire scale" or "jeweler's bane" and other such unpleasant names.

You place the piece, after soldering, in a bath of pickle, that it soaks in for a while. How long? Minutes to less than a week. At about a week, the acid will eat into the surface of the metal, which is usually not desired. With silver and copper you can put the piece

into the pickle directly after soldering. Brass however, must air cool before it is placed in any liquid. If you put hot metal into pickle, keep your distance (arm's length) and use the lid of the glass bowl to shield from splashing.

The process goes faster if the pickle is heated. You can use a hot plate or popcorn popper bottom under your glass bowl, or a crock pot. Heating it causing fumes though, so heat for as short a time as possible, and again consider having good ventilation.

Setting up your pickle pots

Each type of metal you will be using must have its own pickle pot, and no steel item can touch the liquid. For example, say you have a glass dish labeled "Silver pickle" and then someone puts copper in your silver pickle. The next time you put silver in your silver pickle, the copper will jump onto it and plate it. Steel touching your pickle likewise sets off a plating reaction. So the pickle set up must be clearly labeled and kept pristine. Each metal gets its own labeled pickle pot, and only copper or bamboo tongs are used to put items in or out of the pickle. So remember to pick up your item from the soldering block with your regular steel tweezers, transfer them to the copper tongs, and then pick up the lid to the pickle and use it as a shield, and drop the item in.

You will need to buy pickle and mix it. It is sold in a granular form in a can like the kind paint comes in. You need to keep the extra pickle in a glass jar with a good lid, with a rubber seal is best. Unfortunately, those are hard to find in one gallon size so you may want to use the kind juice comes in. (Pickle must be kept in glass or ceramic, never plastic. Crock pots with ceramic insides are fine.) Stir with a dowel rod which you will then rinse off and throw away. Mix OUTDOORS, following manufacturer's directions EXACTLY, and wear a respirator. Remember that you are dealing with an ACID.

Pickle lasts a long time. If it turns sort of bluish color, it's too old. To throw it out, slowly add baking soda. (Very slowly, if you add it too fast, it will bubble over.) Keep adding baking soda until it tests neutral with a pH tester. Then pour it down the sink with the water running. Throw more baking soda down the drain and run the water. If you have old pipes, you might not want to do this. Also, check with your local government for rules and regulations about disposing of hazardous chemicals. The pH testers are availble at pet stores in the fish section and at the American Science Center (see Sources). Another option, easier and arguably more environmental responsible is to simply remove the lid to your pickle and let it crystalize. Once it's all crystalized, just throw away the solid part with your household trash. That way you don't get any nasties in the water system.

More safety: Label all your pickle jars and pots clearly, with words like “acid” and “poison.” If you have children around, Mr. Yuck stickers are a good idea too. An even better idea is keeping chemicals locked and away from children and pets.

Annealing

Annealing is using your torch to loosen up the molecules in a piece of metal. The molecules in metal get close together as you work on a piece, and after a certain point a piece can take no more without cracking (this point is called work hardening). So you torch it. You don’t have to use flux for this, though you can. You place your piece on top of your charcoal block or in the annealing pan and heat it with the torch until it glows “cherry red.” This will be easier to see if the lights are low or off. Sometimes it’s easier to see if you pull the torch off the piece for just a second. Brass must air cool after this, other metals can be “quenched” in water. Dry your piece off well before returning to work, this is because you are likely to use steel tools on your piece (such as a hammer, or a steel block) and these tools will rust if they get wet.

The flip side of annealing is work hardening on purpose. This is called **burnishing.** Sometimes you want metal to be stiff, such as an ear wire or pin stem or jump ring. These items perform better if stiff. To get them that way, use a burnisher (see glossary) and a steel block. Rub the burnisher repeatedly against your metal (which is on the steel block) until it seems stiff when you test it.

Chapter 5 Finishing

What to have at your work space:
polishing motor, preferably with its own dust collector
buffs, labeled
polishes
leather fingertip gloves (optional)

Safety with the Polishing Motor

- Keep edges, points and corners down.
- NEVER polish chain on the buffing wheel - you could lose a finger.
- Hold the piece you're polishing firmly, but don't get your fingers entangled in the piece.
- Wear goggles and a dust mask.
- Concentrate. If your mind wanders for a split second, the piece could fly out of your hands and possibly hit someone, and that someone could be you!

Types of polish

Which polishes to use is slightly subjective; many which appear to be different are just different brands of basically the same grit. Polishing is like sanding, the buffs that go on the motors spindle are the paper part, and the polish gives them the grit. Buffs and polishes work in concert. Use a coarse polish with a coarse buff and a fine polish with a fine buff. Always wear a dust mask or respirator because cotton and muslin buffs give off a lot of lint and the polishes sometimes have ingredients you just don't want to be breathing.

The coarse polishes include: brown tripoli and bobbing. The medium polishes include: Zam and white diamond. The fine polishes include: the rouges in all colors -- red, black, etc. See the Rio Grande Albuquerque (tools) catalog for more on polishes -- they have a really nice comparative chart. Just like with sanding, you start with the coarsest necessary and move up. And just like with pickle, separation is important. Keep each

type of buff and polish separate from each other type. Store polishes in containers with only like polish. (You can store like buffs and polishes together.) Label all your buffs. Write on them with a permanent marker, indicating the type of polish to be used exclusively on that buff.

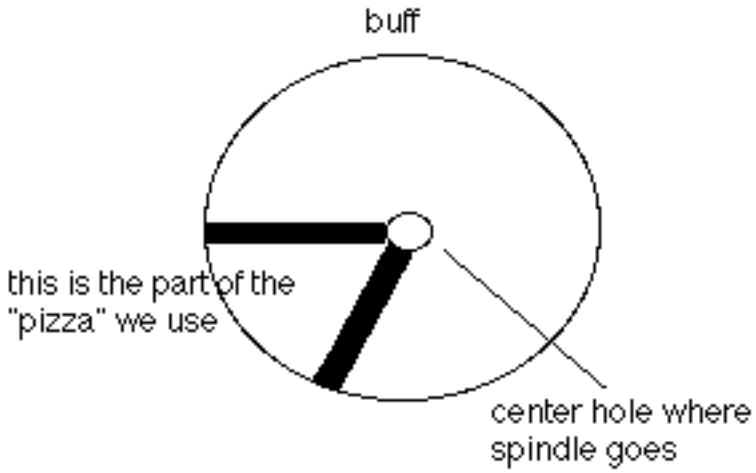
Wash your piece in between polishes, *i.e.* after using one polish and before moving to the next one. If you didn't, then leftover polish on a piece would contaminate you next buff. This would be a problem because, let's say you're doing the final polish on a piece, you're doing a rouge buff, and some left over white diamond polish is on your buff. That could mean that your beautiful high shine piece all the sudden has a spot on it which is less shiny (because of the white diamond). Polish is very difficult to remove. Use warm water and dishwashing liquid. Toothpicks also help. A wonderful product is "Buffing Compound Remover," which is available from Rio Grande Albuquerque. It saves a lot of time.

Preparation to polishing

You will want to wear hard plastic goggles with side panels and a dust mask or respirator. Optional are leather finger tip gloves. (Full hand gloves are EXTREMELY dangerous.) These are wonderful because they let you polish longer, since you don't have to stop when the metal gets hot. Also, they keep your fingers clean. I wear them on my thumbs, index and middle fingers on both hands. Before you put them on though, put the buff you want on the polishing motor's spindle and have the polish out where it is easy to reach.

How to polish

The following information is for your information only. It is imperative that you learn to polish safely from an instructor in person.
(Turn on the motor.) Hold your piece firmly in both hands, supporting it from behind. Use only the lower one quarter of the buff. (If the buff were a pizza, you'd cut it into four slices, but only eat one.) Hold your piece to the rotating buff with some pressure, but not really PUSHING into it. Rotate the piece in a circular manner. When one area is done, pull back from the buff, rotate it in your hands, get a new, good grip, and repeat until done. Remember to polish both sides and the edges. Wash before moving to the next polish. Again, just like sanding, you polish in one direction with one polish, and with the next polish, you polish in the opposite direction (you do this by changing the way you hold the piece).



Use of the flexible shaft to polish

To use this machine you will need to purchase the accessory mini buffs, which come in all the same types as the big ones. To "load" them with polish, press down on the foot pedal and put the rotating buff up to the polish bar. Then polish by holding the buff perpendicular to the metal and moving it back and forth across the metal. (See more on this tool in the next section.) Just like with the big buffs, label these and keep them separate from each other.

Another way to finish with the flex shaft is to use the abrasive wheels that are sold for this. They come in various coarseness are each brand is different -- buy an assortment and experiment.

Chapter 6 Surface Textures

What a dull, dull world it would be if it weren't for surface textures. Spice up your jewelry with textures and patinas. You can create textures with a power tool, the flex shaft and a bit, or with a hammer and specially made "chisel" looking things called stamping or design tools and matting tools.

Safety with the Flexible Shaft

- Wear goggles and a dust mask. Some of the tiny abrasive wheels used with the flex shaft contain glass. These can build up in the lungs and cause respiratory problems.
- Use a light touch, do not bear down.
- Be sure the drill bit is held snugly in the chuck.
- Remove the chuck key before you turn on the machine.
- Use faster drilling speeds for smaller bits and slower speeds for larger bits. This makes cutting easier and helps prevent breakage.

Repousé vs. stamping

This technique involves a tool which looks like a small chisel, usually with one end having been worked so that it has a particular shape or pattern. This worked end is then placed against the metal and the opposite end is struck with a hammer or mallet.
This type of tool has a rich history in many nations. In America most of us are familiar with the Native American use of this technique on sterling. For these kind of work, the metal is stamped on the front of the metal and the tools may have designs formed on them. This tool also has heritage in India in the technique of repousé, which involves creating a pattern, design or image on metal by striking the reverse side. Tools for repousé tend to have shapes on the ends as opposed to the designs of stamping tools. Another type of repousé tool is the "matting" tool, which has rows of tiny raised dots on the working end of the tool. It is used to create a raised area, such as a background in a design. Another basic difference between the two techniques is that repousé tools are held at a slight angle, while stamping tools are held straight up and down.

If you want to learn more about this technique consult Metal Techniques for Craftsmen by Oppi Untracht (by the way this book is a classic reference book, and very comprehensive).

Stamping

What to have at your work space:
steel block (or anvil or vise with flat work area)
stamping tool(s)
ball pein hammer or rawhide mallet
metal to work, and design

When stamping, the steel block is essential; it ensures that the design comes out clear and sharp. If you tried to stamp directly against the table top, then the metal would become depressed (dented in) around the area where the stamp struck. Usually stamps are used repeatedly to create an all over pattern, or a line. Similarly, a simple stamp of a slightly curved line can be used to make something else, such as a flower.

Here's what to do: gather your materials, with your design in mind, place the metal on top of the steel block, hold the tool where you want it to go, hold the metal still at the same time, and strike the tool with the hammer. Now repeat until done, making an effort to strike the tool with the same amount of pressure each time. (If you are using a stamping tool, you will hold it up and down, if you are using a repousé tool *as* a stamping tool, then you will still hold it at a slight angle.)

You will do your stamping as the last or one of the last techniques on your piece. Keep in mind that the pattern will get a little "lighter" or less deep if you polish it afterward.

Note: When stamping, use only "regular" hammers or mallets. Do not use "forming" or "forging" hammers for this, as striking the tools with them will damage their heads. The heads are carefully formed with subtle differences, which might not be easy to see but which are essential to their use. Even if a hammer's head looks flat, feel it to check. Does it feel a little rounded? It's a planishing hammer -- don't use it for stamping!

Using the flex shaft and burs to create patterns/textures

There is infinite variety in the textures you can create with the flex shaft and its accessories (accessories are the little attachments, usually on mandrels that one uses with the flex shaft). Like stamping, designs done this way involve repetition. One way to make a texture is to put a bur in the chuck of the hand piece and then (with the motor on) run the bur back and forth across the metal or part of the metal. You can even write with burs, so just think of the detailed designs you could make. Again, these patterns will become more subtle if polish, so keep that in mind as you plan your piece. All you need for this technique is the basic skill and knowledge of the flex shaft, some accessories, and some imagination. To learn more about the flex shaft, check out The Flexible Shaft Machine by Harold O'Conner.

Hammered textures

A very popular texture is the hammered look. This is so well liked that manufacturers put dents in plant pots on purpose to try and make them look as though they were made by hammering. This technique can be used for a whole piece, or a part for contrast. It lends itself particularly to cuff bracelets. Again you will need some metal, a steel block and a hammer. A ball pein hammer is fine (you'll be using the round end), but a forming hammer is better. (If you are making a bracelet it should already be cut out, filed, sanded, and maybe polished by the time you get to this step.)

Start at an end of your metal, hold it in your non-dominant hand against the steel block at an angle, so that your hand is in the air and the end you're about to work on is on the block. Now with the appropriate hammer comfortably in your dominant hand, raise it and then strike the metal. Basically, you just hit the metal over and over until the entire piece has hammer marks on it. You may wish to strike blows in groups of three near each other. So it goes like this: bang bang bang. rest. bang bang bang. rest. etc. Remember when we talked about work hardening and annealing? That applies here. At some point you may notice that the metal just isn't showing the marks as deeply as before, or that the metal is very stiff. That means it's time to anneal. Also, anneal before starting.

Patinas

What to have at your work space:

liver of sulfur, mixed
silver
quality paintbrush of appropriate size

A patina is something on the surface, usually it doesn't go very deep, it connotes a color change from the usual color of the material, and in older materials can indicate age. The patina that most people know about is the green one that forms on copper, but there are a whole range of patinas. The most important one for silver is a dark patina; this is wonderful for contrast between shiny silver and the dark gray, black or brown of the patina. To learn more about patinas consult The Complete Metalsmith by Tim McCrieght or The Colouring, Bronzing and Patinization of Metals by Hughes and Rowe.

Patination on silver using liver of sulfur

This stuff gets its name in part because it smells like sulfur. The smell doesn't bother me any more, but I remember it used to -- and it sure bothers anybody who's nearby when I use it! For this technique either the metal (silver in this case) or the liver of sulfur must be hot. One could heat the liver of sulfur and then immerse the piece in it, but this is a bad idea for two reasons. First, usually one only wants to darken part of a piece, since contrast is the point, and second, the fumes get worse when you heat it.

Step one: preparing your workspace

Liver of sulfur just loves silver, it jumps on it whenever it can. So it's a good idea to remove all your rings before you do this (gold too) to avoid having to polish them. Also, remove any other silver from your workspace. Realize that you will be using a heat source of some kind, and take appropriate precautions.

Step two: preparing the liver of sulfur

This stuff is sold two ways: as a liquid, ready to use, and as a "dry" you mix with water. The dry comes in a can (it has to be kept from light) in clumps. You choose a clump, break it up, get it to dissolve in water. The "recipe" is a pea sized chunk to half a cup of warm water.

Step three: heating the metal and applying the liver of sulfur

I happen to have a old popcorn popper, so that's what I use. You could also use an old pan on camping stove (you don't want to do this in your kitchen), or an electric coffee pot warmer. Place the item down on the heat source, with the side you're going to patinate face down, if possible. Test the heat of the metal as you would for an iron; touch your finger to it and pull it away quickly. When it's hot, take it off the heat source and put it down, face up.

Use your appropriately sized quality paint brush, dip it in the liquid, and paint it on the metal, reloading when necessary. This is another one of those techniques you just have to practice and get a feel for. If the metal is too hot, the liquid will sizzle and spray all over (meaning, where you don't want it to), and may flake off later. If it's not hot enough the color won't be very dark or it may not work at all. This continues once you've begun painting it and it starts to cool; you must notice when this happens and put it back on the heat. So it's a race against time, and your goal is to get the color even and so that it will stick.

Conclusion

How was it? Hopefully you've had some great successes and learned from your setbacks. Like everyone says at graduations, endings are also beginnings, and at this point, when you have finished this book, you are no doubt wondering, "Where do I go from here?" The following pages, "How to continue your jewelry education," will get you started on that. These pages don't have all the answers, but they give you resources you can explore on your own and find what meets your needs. Hopefully this book has helped you define your interests, perhaps through the process of elimination: finding out what you *don't* like.

Logical next steps for you are: more books, more classes, and meeting people, so I've addressed each of these on the following pages. Ultimately though, it comes down to *you*. You deciding what you love best about jewelry, and pursuing that further; you taking the initiative to do whatever you choose to do. The possibilities are pretty endless. Maybe the right thing for you is to continue as a hobbyist, making nice things for yourself and for gifts. If you decide your real interest is in gemstones, you could go on to study lapidary or gemology, perhaps even earning a Graduate Gemologist diploma from GIA. You might decide repair is your thing, and go to trade school. I could go on and on with the possibilities -- there are just so many -- and any of them are open to you!

Remember: learning about jewelry is like sawing -- it's a journey, not a destination. Hope your journey is a great one!

How to Continue Your Jewelry Education

Through Courses

Contact your local art centers, park districts and community colleges to find out if they offer jewelry or related classes. Just use the phone book and your local newspaper.

Check my blog, All Things Metal Clay at www.CreativeTextureTools.com/news for recommendations of places to take classes.

Through Self-Education

What do I mean by self-education? I mean read alot, alot, alot. Read catalogs, read magazines, read lots of books. Go to lectures on jewelry making. Go to auctions that include antique jewelry. Spend time with your tools or in the studio and experiment. Just try something and see what happens! Be curious! You will be amazed at the things you can do.

Buy a membership to an art center - at a college or university, or at a private art center such as those listed above. Membership gives you access to studio work space and tools. Work on your own, consulting books for ideas and answers to questions. Sometimes there will be a monitor to answer your questions.

Your local **library** should have a decent collection of books on jewelry and silver. Some books have step by step instructions for a project you can complete.

To order books of your own, call the **GIA bookstore**. They call their catalog "the most comprehensive source for Gemological books and accessories" and it's that for gemology and may be for jewelry too. **Borders Book Shop** has a respectable crafts section, with copies of some of the "standards." Check your local quality book store.

Meet people. Network. Do this by joining a bead society (or a professional association, if you've decided to go pro) and get to know people at the local stores where you shop. Networking prevents reinventing the wheel.

Magazines

Metalsmith
Art Jewelry
Jewelry Artist
Ornament
Gems and Gemology
The Crafts Report

Through Bead Societies and Local Metals Guilds

Find these through magazines and on line. Some are:

PMC Guild
Chicago Metal Arts Guild
Creative Metal Arts Guild
Society for Midwest Metalsmiths
Society of North American Goldsmiths

Appendix A

Glossary

A

acid Jewelers use acids in various processes such as plating and pickling. Pickle is a mild acid in which an item of metal is placed after soldering to remove oxides.

alligator clips These are metal grippers which open and close when pressure is applied; usually attached to a stand so that clips are raised. Used during soldering to keep items in place.

annealing Heating metal which has become workhardened to loosen the molecules so that the metal can be worked further.

anvil Steel block, usually with a horn (extended part which ends in a point and is used for forming and raising) used in hammering techniques for which a hard surface is needed.

appliqué soldering (also called sweat soldering) Soldering one piece of metal onto another, usually a smaller piece onto a larger one. Usually solder is applied to only one of the pieces.

B

bail A type of finding. A loop or double loop, usually metal, which is connected in some way to a pendant. Used to hang the pendant on a chain or cord. A jump ring can serve as a bail.

baking soda Household cleaning powder used to neutralize acids and acid spills. An important safety item to have around.

ball pien hammer Double headed hammer with one head being flat and the other round. Come in assorted sizes, with each head being proportional to the other.

bezel A metal setting for a stone, usually a one cut in the cabochon style. Setting encircles entire base of the stone and holds it in place with the thin sheet of metal (bezel wire). Bezel settings should always have a hole in the base of the setting (where the base of the stone will go) in case the stone ever needs to be removed.

buffing wheel (also called buffing motor, polishing motor) Power tool, usually 1/4 to 1/3 horse power. Motor has spindle which extends from one or both sides and spins counterclock-wise (toward the user). A buff is placed on the spindle and charged with polish. The tool is used to finish a piece; create a surface which is evenly "shiny" or "matte."

burnish To intentionally work harden a piece of metal in order to make it stronger. Example: pin stems and ear wires are usually burnished because stiffness makes the item more effective in its purpose.

burnisher Steel tool, usually with a wooden handle. Varieties include straight and curved, and are available in different lengths. Used on metal against a steel block to intentionally work harden.

butt soldering Soldering two items end to end, with each piece filed so that they meet perfectly. Example: two ends of a fabricated ring.

C

craftsperson (also crafter) One who creates craft, who has studied and attained a certain level of achievement in her/his field. An encompassing term which includes crafters in many disciples such as weaving, pottery, metalsmithing, knife making, blacksmithing, jewelry, and more. (Craftsperson, craftspeople and crafter replace the outdated and gender specific term craftsman/men.)

calibrated Refers to a faceted gemstone which has been cut exactly to a standard size. This standardization makes stonesetting easier for the jeweler because it allows she/he to purchase stones and settings (or make settings) knowing they will work together.

casting Creating items in metal through a multi-step process which does not require exclusively the working of metal, as fabrication does. In the lost wax process, a model of the desired item is made in wax and then immersed in investment (like plaster) inside a flask. The wax is then burned out, usually in a kiln, and then melted metal is poured into the resultant empty space (left by the wax) either by centrifugal method or vibratory method.

contamination Occurs when polishes are mixed on metal work pieces or buffs or in pickle when steel or unauthorized metals enter pickle. When contamination occurs in pickle, the pickle must be thrown away. Buffs may need to be washed before re-using. To be avoided.

charcoal A fire safety device and heat enhancer. Sold for jewelry use in block form. Items for soldering are placed on top of the charcoal block. Heat from the torch flame warms the charcoal block which in turn warms the metal. This additional heat source helps the piece stay hot and evenly heated. Because charcoal emits heat, it is not safe to use alone (is in, directly on top of a wooden table); these should always be used in conjunction with fire bricks or ceramic pads.

D

drilling Using a power drill or hand drill with drill bits (small cutting devices) to force holes into metal.

E

easy solder A type of hard solder. Has the *lowest* melting point of the three most commonly used hard solders.

epoxy Type of glue which comes in two parts: resin and hardener. Comes in varieties which dry in different lengths of time, such as five minutes or two hours. Better able to withstand daily wear and contact with water than most glues. Usually can only be removed with special chemicals. Epoxy is acceptable for repairs of costume jewelry and for items

which can be joined in no other way, and as a last resort. Epoxy is NOT an acceptable substitute for soldering, riveting, connecting by jump rings, or other accepted metalsmithing techniques.

F

fine silver Silver which is 999 parts pure silver out of 1,000.

findings These are the functional parts of jewelry which facilitate its being attached to chain, cord or clothing. The name for the group of items which includes ear wires, ear posts, bails, pin catches/joints/stems, clasps, and the like.

fabricate To create something from metal (such as jewelry) raw materials such as sheet metal and/or wire, and using direct techniques such as sawing and soldering.

fusion weld To connect items of metal (usually findings to a piece) without torches or solder. Requires special welding machine and specific type of findings.

fibula A broach which includes as an integral part of its design the pin stem (*i.e.* the item which affixes the broach to the clothing).

file A steel tool with one or more cutting surfaces.

filing Using a file to manipulate the shape of metal, or to smooth a piece's edges and/or surface. A file is a steel tool with one or more cutting surfaces.

finishing General term which covers sanding, filing, polishing and tumbling (rotary finishing). The process of gradually changing the surface character of a piece until it reaches the desired finish and appears even.

forming hammer Hammer with two heads, both of which are rounded and bulbous. One is larger than the other. Used to "form" or "raise" shapes from flat metal, such as a bowl.

G

grinding Removing surface material from metal through repeated application of rough abrasives such as an abrasive wheel on the flexible shaft or a grinding motor.

H

hammers hand tools with wooden handles and steel heads used primarily to shape metal by striking.

hard solder A type of hard solder. Of the three most commonly used types of hard solders, this one has the *highest* melting point.

hard soldering A type of soldering. Requires higher temperatures than soft soldering. Utilizes silver solder or gold solder.

J

jeweler's saw An important hand tool for creating jewelry by hand. Uses saw blades which are available in assorted thicknesses and cutting strength. Sawing takes place by the repeated moving of the saw up and down through the metal, with the cutting taking place on the down stroke.

jump ring Wire in the shape of a circle with an opening. A cold connector used to join items.

L

liver of sulfur A type of chemical used to create a dark surface oxidation (tarnish) on silver. Done to create contrast.

lubricant Used on saw blades to make sawing easier. The wax (lubricant) melts due to the friction of sawing and then the liquid wax allows the blade to move more freely through the metal. Term can also be used to refer to oils used on power tools (tumbling machine, flexible shaft) to keep them running well.

M

mallet Similar to a hammer; head is always cylindrical. Wooden handle with a rawhide or plastic head.

married metals Soldering together metals of different colors and then removing parts of upper layers so that the contrasting layers beneath can be seen. Can be done with as few as two layers of metal.

medium solder A type of hard solder. Of the three most commonly used types of hard solders, this one has the *middle* melting point.

metalsmithing General term which covers silversmithing, goldsmithing, blacksmithing and the use of similar techniques on other metals such as brass and copper. Refers to the working of metal by hand using various techniques. An inclusive term.

mokame gane A Japanese technique. Soldering together many layers of metals of contrasting colors; once a "stack" is created, it is cut in half and the two halves soldered together. This action and additional ones are repeated until the resultant metal is a sheet of beautiful, highly patterned metal which cannot be soldered.

mold making The creation of a rubber mold which contains the shape of an item of jewelry and (sometimes) the sprue which is required to cast it. The rubber mold is filled with wax. Mold can be used repeatedly, so is useful for making multiples of an item.

P

paste solder Form of solder which consists of tiny bits of solder imbedded in a paste (such as paste flux) Used mostly for production when many similar items need to be soldered.

patina(s) Surface coloring of metal, frequently through the use of chemicals.

pickle A mild acid which is used to remove oxides which form on metal during soldering or other heating techniques.

planishing hammer Hammer with two heads which appear to be flat, but which are actually slightly curved outward, with one being more curved than the other. Used to remove hammer marks caused when an item was raised or formed.

R

raising Causes a flat sheet of metal to take on a three-dimensional shape without using soldering. Item is "raised" entirely by the use of hammers, anvils and stakes.

ring vise A hand tool for holding rings while working on them, such as while setting stones in the ring or polishing it. Made of two pieces of wood with a hinge at the center point. The ring is placed in the leather covered jaws of the vise and then held in place by pressure when a wooden triangle is placed in the opposite end of the vise.

S

sanding Smoothing metal's surface by repeatedly rubbing it with sandpaper, a paper with an abrasive on one side.

saw blade A thin metal item with cutting teeth used for sawing metal; used in a jeweler's saw frame.

sawing "V" A wooden tool used when sawing metal with a jeweler's saw. Used to brace the metal; the metal rests of the outer edges of the "V" and the saw blade cuts the metal at the open part of the "V."

soft solder A type of hard solder. Of the three most commonly used types of hard solders, this one has the *lowest* melting point.

soft soldering Soft soldering is lower temperature soldering than hard soldering. There are two types of soft soldering, one of which can be used on silver, and another which cannot. (see also tin soldering)

soldering Causing two or more metals to be joined using heat and another metal (solder) which has a lower melting point than the metals.

soldering pic a small wooden handle tool with a steel working end which has a sharp point. Steel part is about four inches long. Used during soldering to move items or to draw solder to a desired location.

soldering tweezers tweezers with wooden finger grips used during soldering (since metal gets hot when placed in or near flame); usually of the interlocking type.

spring ring A clasp which operates with a spring mechanism and is round; used to connect bracelets and necklaces during wearing.

stamping Creating designs on a metal's surface using small chisel-like tools which have a pattern, shape or design on one end. The opposite end is struck with a hammer or mallet.

sterling silver Silver which is 925 parts pure silver out of 1,000.

supplies Items used in jewelry making which are consumed as a part of their use, as opposed to tools, which are durable. (Example: saw lubricant, flux.)

sweat soldering (also called appliqué soldering) Soldering one piece of metal onto another, usually a smaller piece onto a larger one. Usually solder is applied to only one of the pieces.

T

textures Surface patterns on metal which are not very deep and which add to the interest of the piece.

Tin soldering Not to be used on silver. A type of solder which has a lower melting point than any of the hard solders. Used in stained glass making and electronics.

tools General term referring to items used in creating jewelry which are not used up or destroyed in the process, but endure.

third hand A tool used in soldering to hold an item in place. Consists of a stand with either tweezers or alligator clip(s).

tripod A three legged stand with a circular top, used with a screen on top of it during soldering to allow heating from below.

torch A tool for heating metal. Used in heat coloring, soldering, reticulation, fusing and annealing. Usually made up of tanks of gas or gases, regulators for said tanks, and hoses from tanks to the hand pieces. Gas combinations include: propane alone, butane alone, oxygen/propane, oxygen/acetylene. Different gases have different levels of heat they can achieve; some are dirtier than others, and some are heavier than others. Also, prices and types of canisters gases are available in vary. The simplest type of torch is the gas only torch with the hand piece attached directly to the tank (propane sets like

this are sold at hardware stores and are probably the most affordable type of torch); this type has one gauge (on/off switch).

V

vise A large tool for holding a work piece in clamp like jaws that screw tighter or looser. Usually made from pot metal; able to be attached to a workbench.

W

work hardening a state of metal which cannot be shaped further because it has reached its limit. The molecules have been forced close together and the piece must be annealed to loosen the molecules.

Y

yellow gold filled base metal joined with a top layer of karat gold. Yellow gold filled (aka YGF) has a thicker layer of gold than gold plated items. Described in terms of the karat of the gold used and the thickness of the layer, as in 14/20, where 14 signifies 14 karat.

Appendix B

Birthstones

January	Garnet
February	Amethyst
March	Aquamarine or Bloodstone
April	Diamond
May	Emerald
June	Pearl or Moonstone
July	Ruby
August	Peridot
September	Sapphire
November	Topaz, Citrine
December	Turquoise or Zircon

Inch - B & S Gauge Chart

B & S Gauge	Inches (in decimals)
30	0.010
29	0.011
28	0.012
27	0.014
26	0.016
25	0.018
24	0.020
23	0.022
22	0.025
21	0.028
20	0.032
19	0.036
18	0.040
17	0.045

16	0.051
15	0.057
14	0.063
13	0.072
12	0.081
11	0.091
10	0.102
9	0.114
8	0.128
7	0.144
6	0.162
5	0.182
4	0.204

Mohs Scale of Hardness

Hardness	Mineral
1	Talc
2	Gypsum
3	Calcite
4	Flourite
5	Apatite
6	Feldspar
7	Quartz
8	Topaz
9	Corundum
10	Diamond

