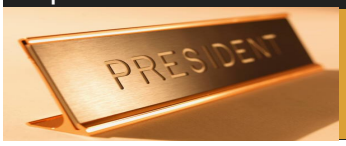
Woodturners Guild of Ontario

LOCAL AAW CHAPTER

Woodturner **n. A person who enjoys the art and process of shaping wood into various forms**

"ask not what your guild can do for you; ask what you can do for your guild— you get back what you put in"

April 2009 VOLUME 5 ISSUE 1



Message from Richard Pikul, President

This is an election year for our guild, and the end of my term as President. I can truthfully say that I have enjoyed the experience. I did not expect that the best rewards would be getting to know members better and seeing projects completed. The hiccups and problems were small and easily solved as we have a good executive and some helpful members.

It is now time for other members to step forward and assume some of the positions on the executive. If you have any experience as a supervisor or manager in your working life, a WGO executive position would be a breeze.

If you feel apprehensive about taking on one of the elected positions, there are 'members at large' positions available. Each of these involve taking on a single task which will give you time to get adjusted to how our guild is run. With this experience, stepping up to an elected position would not be difficult.

I will be dealing with this subject in upcoming meetings. If you have any interest, please contact me for further information. My email address is on the web site and I can be approached at any meeting to discuss this or any other subject.

Think seriously about taking on a position, it's a great opportunity for you to have your ideas implemented.

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IT's YOUR GUILD - BE INVOLVED !

Share your talent and learn from others at the same time.

Do you have ideas for us ?

Please tell us how you can help - e-mail the editor at:

WGOeditor@gmail.com

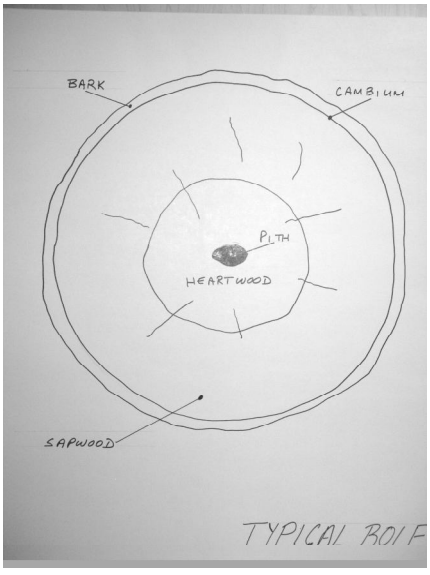
Drying Wood Part 1 of 2
Dave Simmons

Introduction
Guilds were originally formed to share the knowledge of its members with one another. As the "New Encyclopaedic Dictionary" puts it, a guild is "an association of men having similar interests … formed for mutual aid". For us, this information need not be about the core interests of the Guild, it can be about related knowledge from another area of woodworking that can be applied to turning. Such is the case with drying wood.

Why Dry Wood?
We are all familiar with the concerns of dimensional lumber. We want flat boards to build furniture, straight lumber for houses – even the cooper wanted wood that was defect-free to make the staves for his barrels. In spite of our desires, wood warps, twists and cracks as it dries from its newly felled state to its final moisture level as a finished product. "Cup" refers to the tendency of a board to lift up on both sides of its edges. "Bow" is the lifting of each end of a board while "Twist" is the rotation of one end of the board by several degrees. "Crook" is the length of a board deviating from straight, often seen in the classic eyeballing along the edge of a board from one end. Finally, "Kink" is a sharp crook, which often forms at the site of a knot. If all of this wasn't bad enough, even after wood is dried, it continues to warp, swell and contract from season to season.

Turners do not have the concerns of cabinetmakers who must carefully understand how each piece of wood will move and use design techniques to accommodate that movement. Often the blandest pieces of wood are chosen to minimize wood movement. Picture the rail and stile of a cabinet door - you seldom see wild grain used for these. If you do, it may be a veneer glued over a much more stable substrate – another trick used to handle movement. Turners seek out the pieces of wood that cabinetmakers run from. We like the flow of grain around a knot, the feathering of a crotch or the flame patterns of stressed sections of logs. Turning easily allows the working of these woods and often the finished piece will contract and expand with the seasons without anyone detecting it. Some of us thoroughly embrace the warping and twisting of wood, displayed spectacularly in the making of a cowboy hat. However, even with the acceptance of this movement, we can use the understanding of how water and wood behave to minimize problems with our pieces and know how to turn with the wood to minimize problems.

The Tree
Wood, of course, comes from trees. We harvest the structural portion of the tree – the trunk, the roots and the branches. Typically, the trunk of a sizable tree or "bole" is used. Imagine the bole as a group of straws bound together, arranged vertically, and held by a glue called "lignin". In coniferous (evergreen) trees, the straws are known as "tracheids" while those in their deciduous (leaf-bearing) cousins are "vessel elements". (*See Typical Bole*). The single outside circle of straws is called the "cambium", the living layer of the bole. This outer layer contains the sap and transports it from the roots to the branches. Sapwood extends into several layers of straws where it stores food



Typical Bole

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for the tree. The inner group of straws make up the heartwood that provides the strength of the tree while the sapwood provides flexibility. The heartwood is formed as the sapwood cells die, creating extractives along the cell walls, often changing the colour of the straws. Yearly growth of the tree sees the cambium building up a ring of cells just under the bark, creating a growth ring. If there is a visible difference between the cells as the seasons progress, the inner band is the earlywood or springwood and the outer band is the latewood or summerwood. The earlywood is softer than the latewood, giving rise to sanding ripples that in species like ash create contoured effects. Some cells form vertical ribbons that extend across the growth rings called rays, which are clearly visible in white oak, especially if it is quartersawn. When a tree is cut down, the water travelling up the cambium is trapped and cannot get out. Let's look at what happens when this water tries to leave the log.

Water Removal

Ninety percent of all problems with working wood can be traced back to water and that is probably a conservative estimate. We know from turning green wood that a lot of water is trapped in the log when we bring it into the shop. I'm sure that some of us have considered a Scuba suit at times! Two types of water exist in the log when it hits the ground: "free" and "bound" water. Free water is the liquid contained in the cells of the wood. Bound water is contained in the walls of the cells. Free water makes its way out of the cells first, leaving the bound water behind. Once all of the free water has left the wood, the Fibre Saturation Point (FSP) is reached. This is like pulling a sponge from a bucket of water and squeezing it until no more water runs out. The sponge is left damp with some residual water inside. At this point, the wood has undergone no dimensional changes, no twisting or cracking, just the emptying of the cells. If the wood is in a one hundred percent humidity environment, no further drying of the wood will take place: the wood is in equilibrium with the air around it. However, as the humidity decreases, a moisture differential is set up between the wood and the air around it, creating a driving force to remove more water from the wood. Water slowly begins to evaporate from the cell walls causing them to shrink and gain strength. Drying will continue as will the shrinkage and strengthening until the moisture in the wood is in equilibrium with the air around it. Conversely, if the moisture in the air around the wood increases, the wood picks up moisture and begins filling the walls of the cells. This is why a hardwood floor has no gap between the swollen boards at the end of a humid summer where the moisture content of the wood can be twelve per cent and why it opens up those gaps in the winter as the moisture content drops to six per cent, shrinking the wood. The equalizing process is slow and usually takes months. Theoretically, if a board cut from a tree could dry evenly throughout its dimensions, we would seldom see a crack or a twist. Let's move from theory to reality.

Drying Real Wood

Consider a typical board that has been sawn from a log. The board is cut parallel to the trunk and the end is perpendicular to the radius of that log. Cells are arranged vertically along the trunk, meaning that they are also arranged along the length of the board. As the water leaves the board, very little change in the length of the board takes place. However, at the same time, the width begins to change dramatically – usually by eight per cent, but by as much as twelve per cent. The thickness of the board also changed – from four per cent to nine per cent. This is the beginning of

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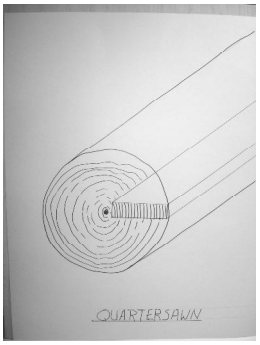
the frustration woodworkers have with drying wood. Not only does it not dry evenly throughout the board, it shrinks by differing amounts depending on the orientation of the board in the bole and the species of the tree. There are still other factors which amplify these differences even further that we will talk about later. Wow!

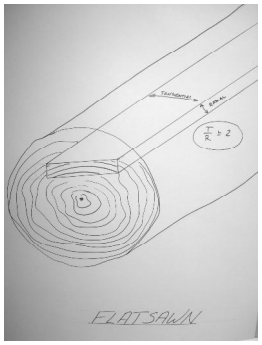
The difference in shrinkage between the species occurs due to the structure of the rays between the "straws". The ratio of thickness to width or tangential to radial shrinkage is termed the T/R ratio. Tangential refers to wood that is tangent to the radius of the trunk while the radius refers to a line emanating from the centre of the log to the outer bark. As the T/R ratio increases, the warping and twisting during drying also increases. In other words, the farther away from "1" the T/R value is the less uniform the shrinkage is. Black Walnut has a T/R ratio of 1.4, making it quite stable while Beech has a T/R ration of 2.2, accounting for the twist often observed in dried boards. Formulae exist to predict the amount of shrinkage in boards as they dry, something very useful to cabinetmakers and furniture makers. In the building trade, a newly built house can have the framing shrink by as much as three-quarters of an inch after the house is built, causing cracks in the drywall.

Board Orientation

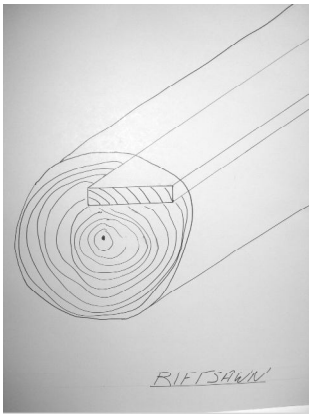
Any board containing the pith (centre of the log) is prone to distortion since the pith cannot always release moisture evenly, since the growth rings are in every direction and not always intact. It is recommended that boards with the pith be cut along the pith to minimize warpage during drying. Quartersawn boards however are much more stable (*see Quartersawn*). Shrinkage occurs evenly through the thickness of the board since the growth rings are orientated vertically and evenly across the board. Here the tangential and radial shrinkage are quite close to one another. Flatsawn boards, giving rise to cathedral grain, have growth rings across the board; showing varying amounts of shrinkage at each point along the rings (*see Flatsawn*).



Quartersawn



Flatsawn



Riftsawn

Shrinkage is not occurring at right angles to the board and varies across the board's surface. Riftsawn boards look like quartersawn, but have the growth rings angled to one side (*see Riftsawn*). It has shrinkage properties between quartersawn and plainsawn or flatsawn boards.

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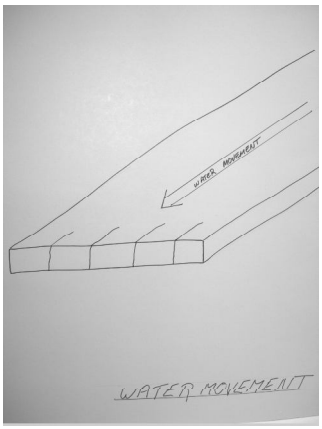
Cracking

If a board cannot distort enough to relieve the drying stresses, eventually the stresses exceed the strength of the board and cracks appear. Moisture is flowing out the "straws" – quickly at the ends and slowly from the middle (*see Water Movement*). Thus, the end of the board shrink right away as the water leaves, but the middle is still full of moisture and has not shrunk. The ends, wanting to shrink, are held back by the middle. When the stresses are great enough, the ends crack and spaces open up, allowing the ends to be as wide as the middle. This is known as "End Checking" and is seen often at the end of a board (*see End Checking*). Coating the ends of a board before drying it is a method used to minimize the drying stresses, as the water will travel out of the ends slowly, hopefully almost as quickly as water is leaving the middle section. This promotes even drying and minimizes cracking.

End Checking



Water Movement

Let's take this approach and see what happens to the log when it dries. If we take a slice of a log showing the growth rings and pith, it will dry quickly, since the water travels through the end grain quite easily. The circumference of the disc wants to shrink more than the radius (T/R is greater than 1) setting up "hoop" stresses that put the sapwood into compression. Often, a crack starts from the pith and radiates out to the bark. Once that is complete, a small pie-shaped sliver opens up allowing the drying stresses to be relieved. Typically, the heartwood dries quickly since it has less moisture than the sapwood and creates an interior radial crack to relieve that stress. In some species, the heartwood has many extractives and does not allow water to pass easily through it. In these cases, the sapwood dries first and sets up hoop stresses around the circumference of the disc, putting the heartwood into compression, causing many cracks around the perimeter. Remember that the logs we use for turning blanks are extended versions of the disc discussed above.

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Woodturners Guild of Ontario Newsletter is published quarterly.
The submission of woodturning related articles to this publication is encouraged. All rights to any submitted articles remain with the author of the article. Deadline for articles & advertisements is the 5th of the month prior to publication.

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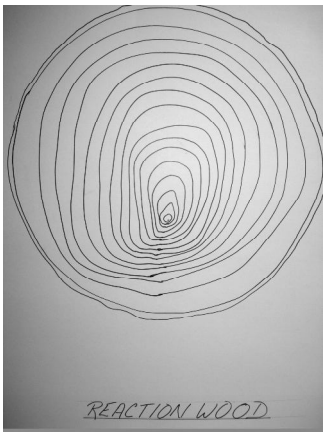
Reaction Wood



Reaction Wood

When trees grow at an angle, a section through them shows the pith being off-centre. The same thing occurs for branch growth. This is called "reaction wood", or wood that is reacting to the pull of gravity as the tree grows and creates a non-uniform growth pattern (*see Reaction Wood*).

In coniferous trees, the reaction wood is on the underside of the trees and is in compression. These forces leave permanent stresses in the wood. In deciduous trees, reaction wood is on the upper side of the tree and is in tension. The wood is often brittle and finishes differently from other wood. Planing and sanding of the wood can produce tear out and fuzzy grain that will not take stains and finishes well. Worse yet, the stresses contained in the wood are released during cutting operations. This can cause a tablesaw blade to be pinched while cutting or wood that can actually explode as it is fed through a thickness planer. Fatal accidents have been documented when reaction wood was used to make rungs for ladders. Unlike regular wood, reaction wood can change its length during drying by as much as twenty times more than normal wood (*see Tension Wood Blank*). As we cut into a piece of reaction wood on the lathe, it can change its shape, split or crack as the wood that is cut away relieves stresses and allows the remaining wood to move. Unfortunately, reaction wood often has beautiful grain and we are drawn towards it in spite of the difficulties it presents.

Tension Wood Blank

(Continued in next issue)

The Woodturners Dance

Mark Salusbury

The Editor called and asked me to get my act together by mid-March so here I am penning the first of what I hope will become a series for your Newsletter.

Let me introduce myself and pass along a thought I have about "the Woodturner's dance". Many of you know me, others…not so much. I'm Mark Salusbury and proud to be a "Life Member" of the Woodturners Guild of Ontario. In 1989 I co-founded and served on the first executive of the WGO and later was elected President for a term or two. Later, with the support of my wonderful WGO executive, we rekindled the defunct Canadian Woodturners Association which I successfully presided over for eight years until "Y2K". For more about me, I invite you to visit my website

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www.salusburystudios.ca .

My “plum” for today...don’t lose the laughter, fun and pride that the WGO was built on and don’t forget to dance!

My time with the WGO, the CWA and many other woodturning guilds have shown me several elements, strengths and weaknesses, common to them all…

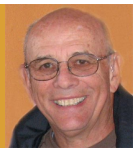
Woodturning clubs begin as a social group based on a common interest in woodturning. Sharing information and techniques forms a pattern of learning which we all benefit from. To keep the exciting momentum going, the group decides it needs to get a little structured, orderly and responsible. An executive is formed of the most qualified folks in the room, a term of office agreed upon, dues levied to buy coffee and cookies, as it’s well known that a woodturning club runs on its stomach, and a time and date is set for meetings so we can be guaranteed a regular “fix”.

All is well in the land of curly shavings until election time. Then, fresh ideas and energy is sought to form a new and (hopefully) dynamic executive to guide the now comfortable enterprise. Reality sets in, things get tense, relationships get strained and the members become as agitated as virgin wall flowers at the Spring prom; no one wants to get up and dance but we all want to keep the fun music playing!

That’s the key…never forget to have fun. If we’re having fun and enjoying learning together we’ll be relaxed, enjoy the club and want to pitch in and be part of it, bringing whatever we can into the mix. Hierarchies and too much structure should be avoided so the fun never trickles away. Don’t let our club get overburdened, otherwise our happy social club may morph into a volunteer group where too few good folks wind up doing too much for too many.

Laugh, socialize, learn and have fun. That’s what it’s all about. Most of all, never forget to join into the dance! Your partners are waiting…

Book Review
Peter K. Kaiser



A SPLINTERED HISTORY OF WOOD
Belt Sander Races, Blind Woodworkers, & Baseball Bats
HarperCollins Publishers, 2008
Spike Carlsen

Whereas Joyce Kilmer waxed poetic on trees, Spike Carlsen waxed historical on trees’ product; wood. For those who might be put off by the concept of history as related to wood, let me assure you this book reads as if Spike takes you by the hand to join him on journey to the many locations where he obtains first hand accounts on the artistic, technical and scientific uses of wood.

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We learn about chain saw wood carving, the manufacture of Steinway pianos, Stradivarius violins, guitars, making of bows and arrows, baseball bats, golf clubs, pool cues, tennis rackets, construction lumber, pencils, tooth picks, catapults, airplanes, water conduits and boats (including Noah's Ark), Venetian gondolas, Howard Hugh's Spruce Goose).

In describing how these items were made, Carlsen frequently visits those most knowledgeable about these products. From them we learn about the history related to these items, the woods that were used and why they were chosen.

And yes, fellow woodturners, Carlsen gives information about the different types of lathes used in the making of hats, artistic turnings, baseball bats, including the famous Louisville Slugger, golf tees etc.

Wood has been a major component of the various houses and shelters humans have constructed. His history of construction lumber and the way it has been used will be of particular interest to all who have had the opportunity to build, add on to or modify a house. I found his discussion of the factors involved in wood rotting and how to prevent wood from rotting particularly interesting.

As one who has had the opportunity to visit Venice, Italy, the city of canals and gondolas, it was interesting to read that it is a city that is "perched on wood." Carlsen describes, in some detail, how wood pilings contributed to Venice's physical stability.

I have only one objection to Carlsen's book. None of the pictures and illustrations are in color. Those of us who love of wood really enjoy its color and patterns (grain). That is the bad news. The good news is omitting color probably made the book very affordable to purchase.

A SPLINTERED HISTORY OF WOOD is an easy read, informative, enjoyable and a useful reference addition to one's library

Click on the following http://www.asplinteredhistoryofwood.com/book.html to find more information.

What's Your Wood IQ?
Spike Carlsen

When I make presentations to woodworking clubs and at woodworking events, I sometimes begin with a wood quiz based on segments from the book. Since the quiz covers many "beyond the workshop" uses of wood, most woodworkers find this to be amusing and informative Match the woods in in the second column, below, with the description in the first column.

To determine your woodworking IQ, multiply the number of correct answers by twelve. 120 and above = wood genius; 84 to 108 = normal wood guy; 72 and under = wood headed.

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COLUMN #1

___ 1) Wood that gave Old Ironsides its nickname

___ 2) Predominant wood the Spruce Goose was built from

___ 3) Wood Stradivari used for his soundboards

___ 4) Wood used for submarine & hydroelectric generator bearings
___ 5) 50,000 year old wood being dredged up from New Zealand bogs

___ 6) Bat used by Barry Bonds' when setting the home run record

___ 7) Wood that most golf woods were originally made from
___ 8) This wood is really a grass

___ 9) Wood that longbows have traditionally been made from

___ 10) Wood sought by Brits for ship masts

___ 11) Smoke from this wood is said to be able to kill canaries

___ 12) Preferred wood for making lead pencils

COLUMN #2

a) Spruce
b) yew
c) live oak
d) Satinwood
e) lignum vitae
f) white pine
g) red cedar
h) persimmon
i) birch
j) bamboo
k) maple
l) kauri

Answers:

1) Live oak (c) planking, four inches thick, was used to sheathe Old Ironsides. In over 30 battles, its hull was never pierced. The wood was of such strategic importance that the US Navy set aside over ¼ million acres of live oak to have in reserve for shipbuilding.

2) Birch (i) was the material used to build over 90% of the airplane. Most components were made using 1/32nd inch thick birch veneer and glue molded using the "Duramold" process. The material was stronger and lighter than aluminum. Spruce was used only for the spars used to support the wings; about 5% of the plane.

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3) Spruce (a) was used for the tops, or soundboards, of all of Stradivari's stringed instruments. Some attribute the unique sound of a Strad to the way the woods were stored: in the swampy lagoons of Venice where they absorbed fungi, bacteria and minerals such as calcium, copper and iron.

4) Lignum vitae (e), a wood of incredible hardness with a high resin content that serves as a natural lubricant, was used for propeller shaft bearings for submarine and battleships up through World War II. The wood still serves as plane bearings in several hydroelectric generators today.

5) Kauri wood (l), verified to be over 35,000 years old via carbon dating at the University of New Zealand, is being "mined" from the bogs of New Zealand. A 140-ton log, discovered in 1994, was extracted and carved into a single-piece circular stairway.

6) Maple bats (k) with tighter grain structure, higher density and greater surface hardness than ash, are now used by nearly half the players in the major leagues. The controversy over maple bats is based on their tendency to shatter into larger and sharper fragments than ash bats when they break.

7) Persimmon (h), which is a member of the ebony family, was the dominant wood used for drivers up through the 1980s. Recent tests show a persimmon driver can consistently outdistance a Big Bertha driver by 3 feet. The earliest golf balls were crafted from boxwood; most early shafts were hickory.

8) Bamboo (j) is used for flooring, furniture and buildings, but is technically a grass since it lacks the cambium layer, responsible for generating the xylem and phloem. It's used for 90% of the scaffolding erected in Hong Kong, often reaching 30 stories or more in height.

9) Yew (b) is the wood most often associated with the longbow. By taking advantage of a section of the tree where the flexible sapwood is the back of the bow and the denser heartwood the belly, bow makers can craft a weapon capable of shooting an arrow 200 yards with deadly accuracy.

10) White pine (f), tall and arrow straight, was the perfect wood for ship masts. As England's forests yielded fewer and fewer "mast-worthy" trees the Royal Navy turned to the colonies for materials. As trouble began brewing in 1774, the colonists stopped exporting white pine; in 1775 the Brits burned Falmouth in retaliation.

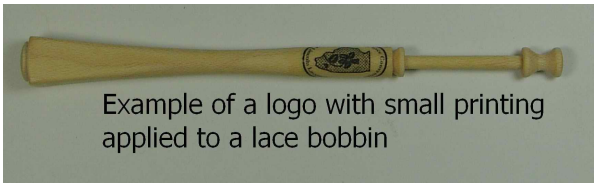
11) Satinwood (d) smoke can allegedly kill canaries and induce slumber in humans. Other wood dusts have other harmful effects: Milky mangrove dust can cause temporary blindness, cocobolo wood can trigger bronchial asthma and nausea, and teak dust can cause swelling of the scrotum.

12) Red cedar (g) has all the properties for the perfect pencil: Stiff enough to support the lead, yet flexible enough to be comfortable, lightweight, easily sharpened, and pleasant smell. As supplies of standing red cedar dwindled, pencil manufacturers bought red cedar barns, railroad ties and fences for their raw material.

Transferring printed images to wood
Richard Pikul

How would you like to have the ability to take anything that can be printed on a laser printer and transfer it directly on to wood? Well, you can – here is a way to do it!

You should read this article a couple of times before starting, so that you understand the process. It will help you be more successful on the first try.


Example of a logo with small printing applied to a lace bobbin

Bare wood surfaces must be sanded to 400 grit minimum. Any coarser will affect the surface appearance of your completed image. Yes, this means that applying the image to open grained bare wood is a real challenge.
The image can also be applied over a finish. I have tested the following finishes with success (after allowing a minimum of 72 hours cure time):
Varnish (oil based)
Polymerized Tung oil
Polymerized Tung oil / varnish combinations (such as General Bowl finish)
Enamel paint.
Water based varnishes and latex paint can also be used, but the finish must be allowed to cure for at least two weeks. It does not work well on shellac as the glue used is water based and will cloud the shellac finish on your work piece.

Here's how you can do it!
Step 1: Print your drawing, artwork, photograph – whatever (after reversing to a mirror image) on a laser printer. Seems simple.... but can be challenging.
If your desired image is already a computer file, then just hit print! No laser printer? No problem! Take your file to the nearest office supply store that also provides printing services on a disc or USB memory stick and let them print your file. It's quite inexpensive, so have them print extra copies. To save even more on costs – If your 'image' is small, you can put several on a page and lower the per image costs.
If you have a photograph or drawing etc that cannot be used directly you can scan the image. No scanner? The same places that have laser printing services also have scanners. Now you will have a computer file of the scanned image which can be printed – just remember to have the service reverse the image so you have a mirror of the original.

IMPORTANT: Reverse your image before printing. This process of applying an image to wood will reverse image your drawing.

O.K. Now you have the laser printed mirror image of your artwork. Don't try this method with ink jet printed images, they will run, as ink jet printer ink is water based and the glue for this process is also water based.

Step 2: Buy some Weldbond glue (if you don't already have some). I have tried many different water based adhesives and only found two that worked well. The other one costs about 6 times as much as Weldbond so I won't even mention it

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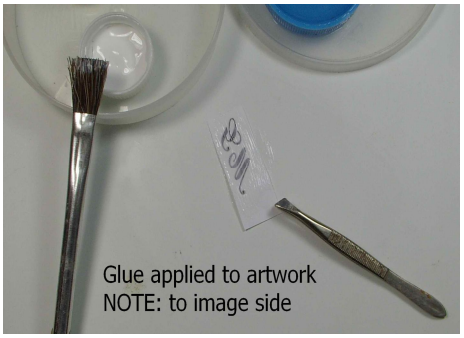
Step 3: Make a work surface. I use a clipboard holding several sheets of paper. The back side of printed sheets work well as you will be throwing them out after use.

Step 4: Pour or squeeze out some Weldbond glue in a small container. I use the plastic caps from 2 litre soft drink bottles for small images and the tops of juice bottle for large images (they are about twice the size of soft drink bottle caps). Stick the caps to a piece of wood or a container as shown in the photo with some double sided tape to keep them in place. Have a container of water close by to wash out your brush.


Glue applied to artwork
NOTE: to image side

Step 5: Ready the wooden workpiece you wish to put the image on. Important - the surface must be clean! As a final step, I clean the piece with a soft cloth wetted with denatured alcohol and allow to dry out for about 20 minutes.

Step 6: Cut out your image leaving just a small amount of edging around the outside.

Step 7: Place the paper, image side up on your work surface. If your image is quite small (most of mine are 2cm x 2cm or smaller) then use a pair of tweezers to hold it.

Step 8: If you are applying the image to a relatively porous wood, or on end grain then prepare the wood by applying a thin coat of Weldbond glue over the area where the image will be applied. To help keep glue to a restricted area you can use painters masking tape to restrict the area as it's hard to sand it off a large area later.....

Step 9: Using a fairly stiff natural bristle brush (should not be larger than 50% of your image) apply the glue to your image. Liberally brush on Weldbond glue **ON THE IMAGE SIDE**. Make sure you have covered the entire image and surrounding paper edging. Smooth out the glue so that a level layer of glue without any missing spots, bubbles or ridges results. If you do this on scrap paper and brush past the edges, you will be able to fully coat the image without messing up your work space.

Step 10: Apply your glue covered image to the wood and squeeze out any excess. Work from the centre to the edges gives the best results. It takes a few tries to determine how much glue is required.

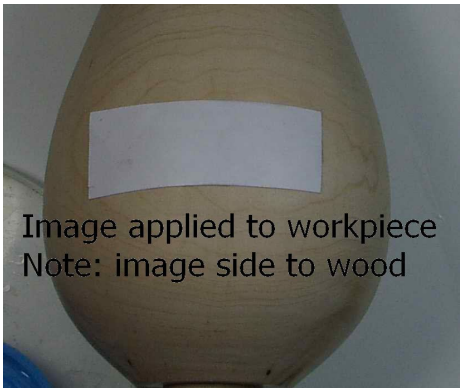


Image applied to workpiece
Note: image side to wood

Step 11: Clean off the excess glue, then wipe the area outside of the image with a wet cloth to clean away any remaining residue.

Step 12: This is the easy one – wait for the glue to cure – at least 24 hours.

Step 13: First wet the paper using a cloth or paper towel wetted with water. With a wet thumb (you could also use a finger), **very lightly** rub the paper. Keep wetting your thumb as the paper will

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absorb the water quickly. Very quickly, the wet paper will 'roll' off, revealing the image underneath. Don't overdo it, the image is fragile at this stage. Only remove enough paper to clearly show your image. The last photo shows what happens when you rub a bit too hard – notice that some of the printing has been damaged.

Step 14: Another easy step – wait for the water to dry off – only needs about 20 minutes. You will know when it's dry enough, the image will become a bit cloudy. If it does not become cloudy, you have hit it in one and can skip the next step.

Step 15: Repeat step 13, but be VERY careful and 'light fingered'. This should result in a clear image after the water drys off.
You may notice that the glue you used to coat the image remains on the wood. It's the way it works! The laser printed image is 'inside' the glue layer – along with a few paper fibres, which 'disappear' when coated with a clear varnish.

Step 16: The third easy step – allow the piece to dry for at least 24 hours, more if the temperature is below 20C or the air is damp.

Step 17: Coat the image. I use high gloss water based varnish. High gloss varnish has no suspended fillers which could cloud the image. You can use a brush, but spraying results in less work. Put on two coats, then very lightly sand with #400 grit paper. If there are any shiny spots, apply another coat, let cure and sand again. If you brush on the varnish, you may need to put on three or more coats before you obtain a smooth finish. Two brands of varnish that work well are:
Flecto Varathane “Diamond Wood Finish”, gloss
Minwax “Polycrylic” “ultra fast drying”, clear gloss.

Step 18: Refine the varnish coating with finer sandpaper, then polish.

Step 19: If you don't want a shiny finish, follow up the polishing step with a quick 'wash' (do not rub, just a wipe) with denatured alcohol. This will dull down the shine without affecting the smooth finish.

Step 20: If you applied the image to bare wood, you can now apply finish to the rest of the piece. If you intend to use an oil finish, then it must be applied to the entire piece first. Applying the image first will result in that area being a slightly different colour.

Step 21: Let me know how you made out.