Woodturning Safety Rules

1. Know Your Equipment and Yourself. Never operate a lathe or use a cutting tool, chuck or other accessory without first understanding its operation and limitations. Read and know the instruction manual of any lathe that you use. Never perform a procedure or technique that you are unclear about or uncomfortable with. If you are in doubt, stop and ask for instruction. Know your personal limitations.

2. Focus on Your Work. You may not operate a lathe if you have drunk alcohol or taken medication that carries an equipment operations warning. Don't operate a lathe if you are tired or emotionally upset.

3. Police Your Environment. Keep your work area clean. Store tools safely. Don't allow cords to run across circulation ways. Don't start your lathe if people are in harm's way. Ensure that there is adequate light and ventilation. If you are observing someone else, don't place yourself in harm's way.

4. Keep Yourself Catch Free.. Long hair must be tied back. No clothing, gloves, jewelry or watches may be worn below the elbow. Necklaces and loose clothing that could be caught by spinning parts must not be worn.

5. Wear Safety Equipment. To operate a lathe or stand near an operating lathe, you must wear full face protection. Dust masks are highly recommended.

6. Secure the Wood. Ensure that the wood is securely held. Turn between centers whenever possible and always with imbalanced pieces. Use a slow speed when first roughing out a piece. Never use wood that is cracked or has other serious defects or significant protrusions.

7. Inspect Your Lathe. Inspect the lathe for damaged or missing parts before operating it. Before you start, check to ensure that the speed is appropriate, the drive belt is tight, all locking devices are secure and all chuck keys and adjusting wenches are removed. Always spin the wood at least one full turn before turning the lathe on - every time. Never leave a spinning lathe unattended.

8. Practice Safe Techniques. Keep your tools sharp. Don't force a tool or use it for an unintended purpose. Reposition the tool rest frequently to keep it close to the work. Keep your balance and don't overreach. Always turn the lathe off and allow it to come to a complete stop before adjusting the tool rest. Always keep your hands behind the plane of the tool rest. Always keep the tool firmly against the tool rest. Always hold the tool firmly with both hands.

When using a shear cut, rub the bevel. When using a scraping cut, always keep the angle between the wood and cutting edge at less than 90 degrees.

When finishing, always remove the tool rest. Use only paper towels, never woven fabric. On exterior surfaces, apply the towel to the underside of the piece with the wood spinning counterclockwise. On interior surfaces, apply the towel in the lower left-hand quadrant also with the wood spinning counterclockwise.

Adopted by Bay Area Woodturners Association, 10 March, 2001

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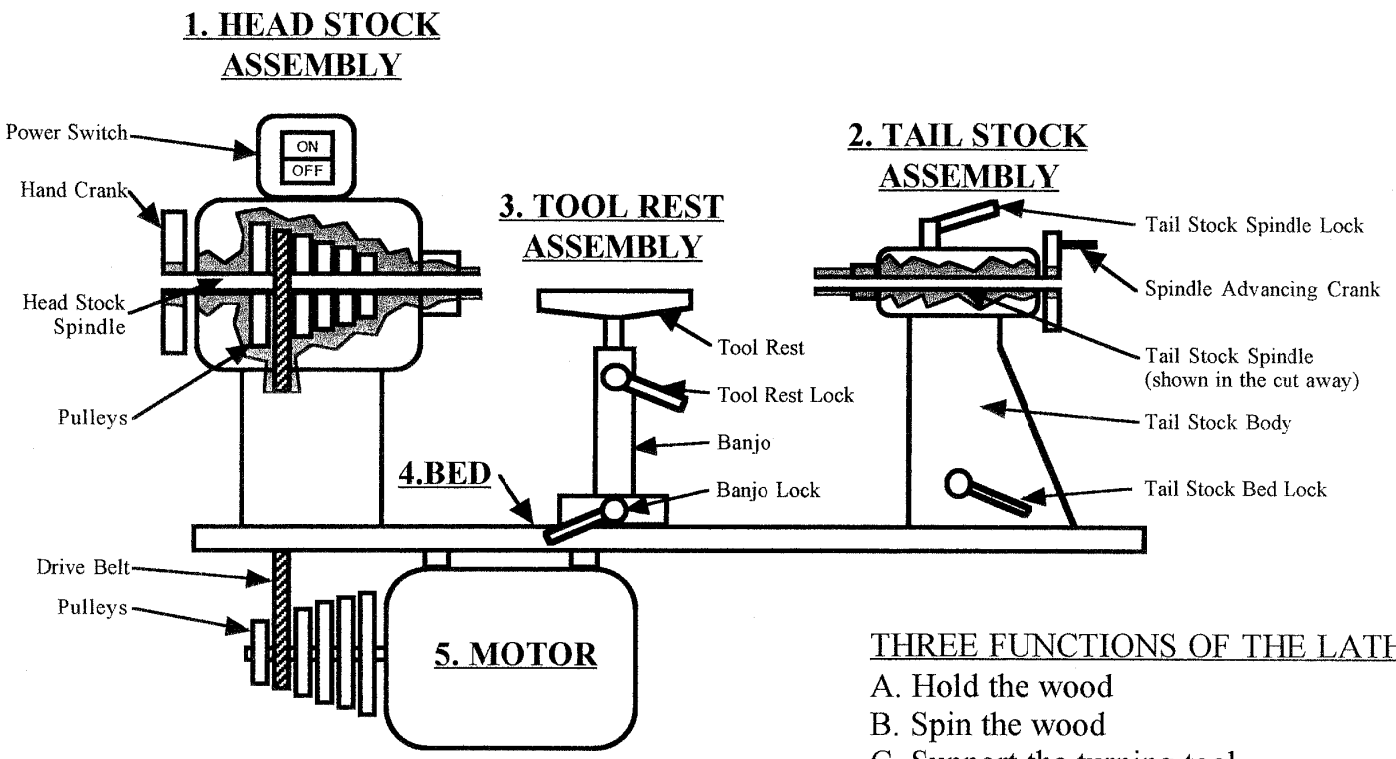
JL Rodgers, Inc – 236 Briar Drive – Martinez, CA 94553

BAY AREA WOODTURNERS ASSOCIATION LOCAL CHAPTER AAW

14 March 2003

HANDOUT #2
FIVE MAJOR PARTS OF THE LATHE



THREE FUNCTIONS OF THE LATHE

A. Hold the wood
B. Spin the wood
C. Support the turning tool

Observations On The Use Of Woodturning Tools

I have been teaching wood turning for about six years and have taught hundreds of beginning students – both adult and teen aged – male and female – short and tall and … you get the point.

Here are the few things that always seem to be beginner's difficulties:

1. Tight body
    a. This means a lack of freedom of movement restricting the fluid motions with the tools causing poor shaping of the project and irregular surfaces due to poor tool control.
    b. Rigid, tight muscles locking the tool tightly to the hand and fighting the wood/lathe combination
    c. All body motions generally need to be expanded, enlarged and used to enhance the cuts' fluidity and ease.
2. Working too fast
    a. Forcing the tool through the wood rather than understanding how fast the wood wants to be cut with that tool and at that lathe speed.
    b. Cutting the wood before planning the best approach to the cut.
    c. Starting without an overall plan of what shape is to be achieved.
3. Cutting with the wrong lathe speed
    a. First projects are normally spindle projects on smaller billets of wood requiring greater RPM's to allow for smooth cutting.
    b. Bowl turning, starting with out-of-balance stock may require the speed to be reduced until the stock is more balanced. Then the speed can be increased to improve the cuts
    c. Cutting projects with voids or discontinuous surfaces required an *increase* in lathe speed for more cutting control.
4. Working with dull tools.
    a. Everyone can recognize the improvement of the cut surface and the greater ease in cutting when a tool is sharpened but few recognize *when* to resharpen the tool.
    b. Sharpening requires a light hand to "dress the edge" rather than "grinding the tool."
5. Not recognizing that you have to "pay your dues."
    a. Doing it again to improve lathe/tool/body operation is called "practicing" which few are willing to do. I suggest make one, examine what could have been done differently – then do it again
    b. Complex project are attempted in quality wood with out doing a prototype – sometimes with disappointing results. Consider making a prototype in plain wood first.
    c. Not making enough spindles

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TOOL CONTROL[1]

- **Role of the Lathe**
  - The lathe does all of the hard physical work. It holds the wood and provides the cutting force.
- **Role of the tool**
  - Always select the best tool for the job and use it safely. Tools sharpness is key to safety and getting a good cut.
- **The Turner's Role**
  - You guide the cutting tool through the wood done with a sure, but light touch. Woodturning is not physically hard work. It's about coordination.
- **Dancing with Your Lathe**
  - 'Dance with your lathe' captures how we want to feel when turning. Like dancing, woodturning is about making graceful body moves.
  - Role of the feet. Guide the tool through the wood using your whole body and not just your arms. Using your whole body gives you more stability and is less tiring.
  - Spread your feet about shoulder width apart. Keep your elbows close to your side. Start a cut with your weight on one foot and gradually shift your weight to the other foot.
  - If the cut is too long to easily keep your balance, make two separate cuts and reposition your feet before the second cut. Moving the legs is less tiring than using your arms. It will be necessary to use only your arms for some cuts, but try to minimize these.
- **Role of the hands**.
  - One hand holds the tool on the tool rest (keeping it from vibrating) and aids in moving the tool forward. The other hand does most of the work. It guides the tool and determines the depth and direction of the cut. Learn to turn reverse hands, there are some cuts that must be done right handed or left handed.

Making a Cut

- **Anchor.** Place the gouge on the tool rest with the flute pointing upward at a 45° angle and in the direction of the cut. Lay your left hand on top of the gouge and contacting the tool rest. All three, gouge, tool rest and your hand, must all be in contact with each other.
- **Bevel**. Using your right hand, move the tool handle until the heel of the bevel contacts the wood. This action will not cut, but will tell you exactly where the wood is relative to the tool.
- **C**ut. Using your right hand continue moving the tool handle until the bevel is parallel with the wood surface and the cutting edge engages the wood. The tool should be cutting between' 11 and 12 o'clock' as you look down on the tool. Slowly advance the tool with the left hand, remembering to steer the bevel with the right hand.

[1] *Tool Control* was originally produced by Bill Small for the Bay Area Woodturners Association

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- **Cutting Feedback**
    - **Listen.** The lathe, tool and wood all give you feedback on how well you are cutting. Learn to 'listen' to the following.
    - **Shape.** You can best see the shape that you are cutting by looking at its profile against a backdrop
    - **Shavings.** If you are producing long shavings, you are shearing the fibers. Chips or sawdust means that you are scraping and will have a rougher surface.
    - **Vibration.** Vibration should be avoided. Excessive vibration may mean a loose piece of wood is ready to fly off the lathe. Vibration can also be caused by excessive lathe speed and the wood being out of round/imbalanced.
    - **Sound.** A rhythmic sound may indicate a knot, crack or other defect that should be inspected immediately. A good cut will 'sing'.

Surface smoothness. Stop the lathe and inspect the surface of the wood frequently. A good shear cut will leave a smooth surface free of tear out and ridges. Tightly grouped ridges usually mean you were not cutting on the bevel. Tear out often comes from a dull tool. Use your fingers to test the smoothness. They are more sensitive that your eyes.

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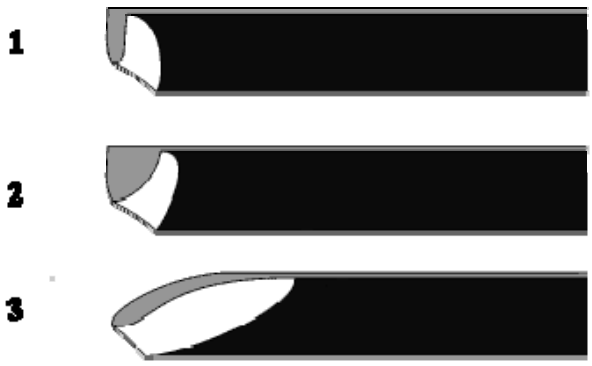
Gouges – Deep Fluted
(the bowl gouge)

The deep fluted gouge is easily distinguished by longer handle and blade as well as the deeper, more massive flute. This allows the tool to be used farther over the tool rest than the shallower spindle gouge – ideal for turning bowls as well as other items.

Out of the box the tool may be ground with a traditional-straight across configuration favored by many English and European turners.

In the U. S. the finger nail profile is preferred for its greater flexibility allowing the tool to do pull cuts and shear scraping. The finger nail profile is also referred to by many names such as Ellsworth, O'Donnell, and Irish grinds. The length of the side grind, whether straight or curved, and the bevel and side angles are all a matter of personal preference.

Several turners use a combination grind – straight on the right side to allow shear cutting on bowl exteriors and pulled back slightly on the left side to accommodate the turning bowl interiors.



1. Traditional - straight across grind
2. Asymetrical grind
3. Finger nail profile grind

When you buy a new tool don't assume these new tools are usable until you sharpen it – the shape is normally for presentation only and not sharp.

The exact bevel angle and the length of the side grind are, to say the least, open to active debate. Allan Batty suggests that the bluntness of the bevel should be a function of the depth of the bowl you are turning in order to keep the bevel in contact with the interior surface all the way to the bottom. The deeper the bowl - the blunter the tip bevel angle.

We normally sharpen with a fixture to provide quick repeatability of our initial grind. Popular to Mny turners is the Verigrind attachment for the Oneway Wolverine system. The bevel angle is set by the angle on the Verigrind attachment and the side angle determined by the length of the Wolverine arm. The tip protrudes through the Verigrind and a constant length normally two inches. Equally useful is the Woodfast version of the Verigrind which will give the same geometry if the little ball on the tip is ground off.

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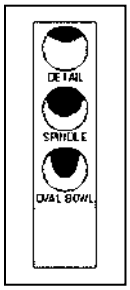
Gouges - Shallow Fluted
(the spindle gouge)

Shallow fluted gouges generally are shorter handled and have a smaller, shallower cross section than the deep fluted gouges. These features allow them to be easily manipulated in working on spindles for tasks such as cutting beads and coves – cuts where the tool is held close to the spindle and vibration is limited.

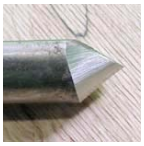


When manufactured the depth of the flute varies and in most cases is about half way through the diameter of the shaft. Those tools that are forged have the flute held higher in the steel and can therefore can be ground into more severe angle for use in detail work.

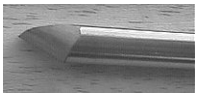
There are three typical grinds:

- Straight across (typically factory grind)

- Swept back to relieve the shoulder for more access to the work



- Severe bevel angle for detail work



Cutting beads and coves can be the most difficult cut to learn as there are three separate motions needed to keep the bevel in contact with the wood since the surface of the work moves from horizontal to vertical as the bead or cove is cut. To keep the tool cutting properly the handle is raised as the cut deepens, the tool is rotated to keep the bevel in contact with the wood and the handle is fanned outward or inward. Three motions all at the same time! The detail is cut from left and right sides working "down hill to the grain:" in spindle work than means towards the center of the spindle.

Cutting beads and coves symmetrically is also a challenge in order to get both faces identical. (I seem to be better at one face than the other.) The solution is practice.

While shallow fluted gouges can be used for shear cutting, the deeper fluted gouges perform without vibration.

Shallow fluted gouges when presented to the center of a piece of end grain and pushed straight inward toward the headstock can be used for boring holes. The left wing cut the wood and the flute extracts the chips. If the handle is slightly lowered or fanned to the rear, the tool can open up an end grain hollow form of reasonably shallow depth. Too deep and the tool is not stiff enough to prevent vibration.

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Scrapers – General

Scrapers are a real work horse tool. They are used to:

- finish cutting bowl interiors where the gouge become difficult to use
- complete surfacing prior to sanding
- make minor shape corrections to a project
- Do the primary cutting in hard, dense materials

Most scrapers in wood turning are ground as about 10-15 degrees. The burr can be left or removed depending on your intensions – for soft wood the burr is retained. I personally like the biggest, thickest scraper that will fit into the project because the mass dampens vibration and stabilizes the tool.

I have a collection of many scrapers that I can match the curve to the project. Some, such as the Sorby multitip has a tear drop cutter that can be rotated to different curves; its rounded shaft allows the tool to be rotated to made clean shearing cuts.

With few exceptions scrapers should be used with the handle raised above center line and the blade trailing below centerline to as to prevent catches – this usually requires raising the tool rest. Rotate the tool rest so that the tool while resting will be slightly skewed over to shear. Holding a scraper on edge is asking for it to be slammed down onto the tool rest with your finger in-between.

Shear Scrapers

Shear scrapping is the process of presenting a scraper to the wood at a skewed angle so the scraper shears across the wood fiber creating a clear cut. Shear scrapping is usually a final cut to address shape or surface problems in the wood. When preparing a shear scraper be sure to round over all edges so that they do not drag on the tool rest preventing smooth tool movement.

Negative rake scrapers

Negative rake scrapers are ground with a compound angle usually 50-70 degrees. The cutting is due to the burr that is pushed up when the bottom side of the scraper is sharpened. The cutting is with the burr so that the tool doesn't last long and should only be used for smooth final cuts on hard woods

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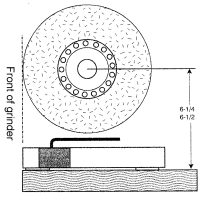
Sharpening Gouges

The reason to sharpen is to improve cut surface quality, speed project completion, and to ease amount of work we have to do. One can tell it's time to sharpen because we are pushing the tool harder, the tool heats up, the surface quality begins to deteriorate, vibration increases and the cutting sound even changes. Also assume that all new tools require sharpening and probably some reshaping also.

Most of us utilize a fixture to assist us because it repeats the desired angles and allows us to return to woodturning quickly. The Oneway Verigrind/Wolverine accessories and the McNaughton, Sorby, and Woodfast all accomplish the identical tasks. The Ellsworth accessory also works well if you only want that one angle on a 3/8th deep-fluted gouge - it is not adjustable.

Mount the Oneway Wolverine attachment directly centered under the grinding wheel, square to the plane of the wheel, and flush with the front of the wheel and about 6 ½ inches below the center of the wheel. That is the same as a piece of ¾ ply under our eight-inch grinder.



The Verigrind accessory is what holds the gouge and allows for the grinding of the finger nail profile shape. The projection of the tool through the Verigrind should be repeatable (2 inches in average). Tilt the Verigrind forward to the fifth notch in order to set the tip angle. By placing it in the Wolverine V-notch 6.75 inches back from the wheel face one gets good tip and side bevel angles which can constantly repeated.

I have made a fixture that resets that distance exactly every time. At the right you can see that fixture and also the small block I use for setting the 2 inch tip projection. Note that the fixture must reference from the *face* of the grinding wheel as its diameter will change over time

Sharpening should start with one *side* of the tool pushing lightly but firmly against the grinding wheel while raising and lowering the handle to create a radiused shoulder. Next complete to the other side in the same manner. Lastly rotate the tool from one side over the tip and completely to the opposite side. This dresses the tip. If the tip gets too pointed, repeat this last step until the tip shape is what you require.

As a last thought, you should also try hand sharpening so as not to become dependent on fixtures. The time will come when the fixture will not work for you or is not available. With the grinder turned off, raise the platform to match the tip angle, and push the tool up the grinder wheel while rotating the tool to keep the side bevel in contact. After practicing a few times you can try it again on an older (and shorter) tool.

For more specifics and a demonstration, go to the Oneway web site and order the fee DVD on setting up and using their lathe accessories (www.oneway.on.ca)

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Stones and Grinders

The purpose of sharpening is to improve cut surface quality, speed project completion, and ease amount of "work" the wood turner does. We need to sharpen when we are pushing harder, the surface quality deteriorates, vibration increases, the cutting sound changes or the tool heats up, and always when the tool is new.

Here are a few general considerations in using your sharpening system:

- Keep sharpening wheels clean and true
- Use light touch (sharpening not regrinding)
- Tool should not get hot or discolored
- Use continuous motions for continuous edges
- Add good light and comfortable grinder height
- Use dusk mask and eye protection

We prefer slow speed (1750 RPM) grinders because they heat the tools less. Grinders should be equipped with Al_3O_2 (aluminum oxide) stones. The stone cut high speed steel (HSS) cleanly, their surfaces are friable (they chip off) leaving sharp cutting edges. The wheel color also is code to its hardness:

- White stones - aluminum Oxide, Al_3O_2
    - Friable surface – stays sharp
- Blue stones - Cobalt added
    - Harder than white stones
- Pink stones - Chromium oxide added for additional hardness
    - Hardest, requires more pressure to use
    - Loads most easily and required more frequent cleaning
- Wheel grit most preferred 60, 80 or 120 grit.

When sharpening our goals is fast, repeatable creation of a non-faceted cutting edge. The use of fixtures improves this process. For more information on fixture setup and the most common angle on tools check my website for the detailed handout on sharpening (www.jlrodgers.com).

With a new grinder or with the addition of a replacement wheel, initial setup is very important. Check new wheel of cracks by listening for a "ringing" sound when striking it with a wood tool handle. If the stone is held in the center and a dull "thud" is heard, return the wheel for replacement as it probably has a crack and is in danger of flying apart when brought up to speed.

After mounting the wheel, grinder vibration must be reduced. Rotating the new wheel to counter balance it helps. Truing the wobbly surface also is important. Note: *Always wear a dust mask for these operations)* Rest the diamond truing tool on the grinder's platform and lightly touch it to the wheel. The high spots will be ground down and the wheel trued to the grinder.

Clean and re-true the surface with a diamond "T"-bar tool frequently. The gray matter that accumulates is metal debris which fouls the wheel, heats the tools are reduces the cutting action. The diamond truing tools also can flatten the surface and remove the groves that sharpening creates.

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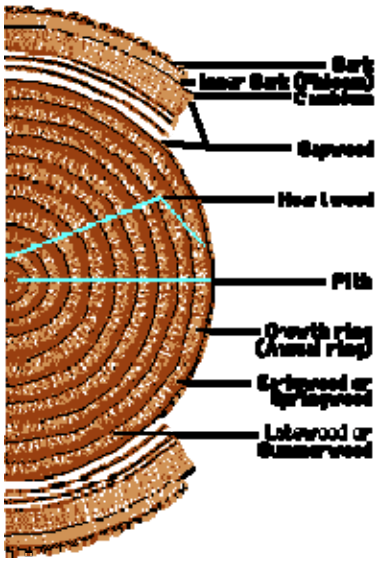
Principle features of a tree stem, cross-sectional (transverse) view.



- $H_20 + CO_{2+}$ nutrients = $C_6 H_{12}O_6$ (Glucose) + O_2 in the presence of Chlorophyll & sunlight in the leaves
- The inner bark transports the glucose to where growth take place,
  - Roots and stem tips
  - The Cambium layer creates new sap wood by forming cellulose and hemi cellulose from sugars
  - Cellulose forms longitudinal tracheids – the tubular vertical structures
- Lignin surrounds the longitudinal tracheids and stiffens and holds them together
  - Lignin is thermoplastic
  - Grass has no lignin – no stiffness
  - Cotton is almost pure cellulose
- Transverse cells or rays transport materials between growth rings
- Heart wood is where the tree stores the extractives,
  - Lignins, waxes, tannins, gums, terpenes, oils, fats, etc
- Dry weight of wood is composed mostly of
  - Cellulose – 50 %
  - Hemi cellulose – 13 to 25%
  - Lignin – 15 to 30%
  - Extractives – 2 to 15%
- Hardwood trees
  - Are generally deciduous trees and drop their leaves in winter
  - Have a broad leave structure
  - Are angiosperms (seeds enclosed in a fruit or nut)
  - Have a more complex cell structure
- Softwood trees
  - Most common are conifers or cone bearing
  - Are gymnosperms producing “naked seeds”
  - Leaves are needles or scales
  - Generally non-deciduous

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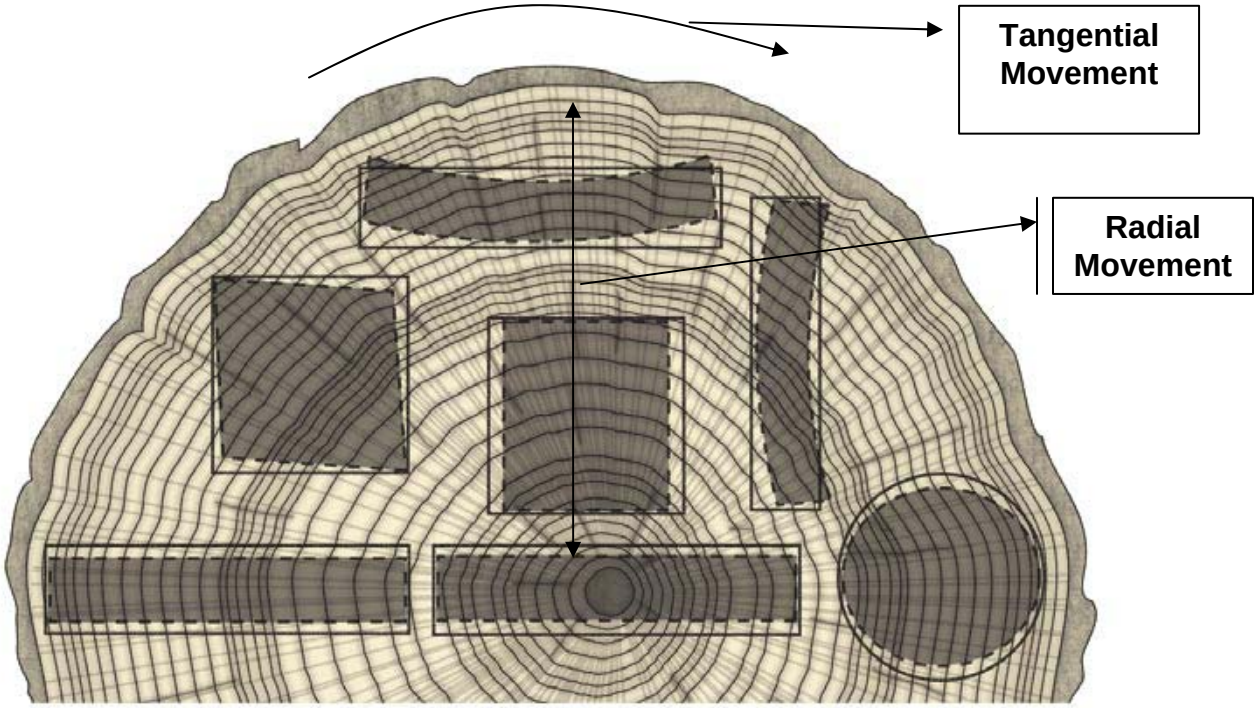
Wood movement



Wood species	% Radial shrinkage	% Tangential shrinkage
Domestic hardwoods		
Ash, white	4.9	7.8
Poplar	3.0	7.1
Elm, American	4.2	9.5
California laural	3.0	9.0
Madrone, Pacific	5.6	12.4
Maple, Silver	3.9	7.2
Mesquite	2.2	2.6
Oak, Live	6.6	9.5
Tanoak	4.9	11.7
Walnut, Black	5.5	7.8
Domestic softwoods		
Cedar, Western red	2.4	5.0
Douglas fir, Coastal	4.8	7.6
Pine, Western White	4.1	7.4
Redwood, Young growth	2.2	4.9
Imports		
Bubinga	5.8	8.4
Cocobolo	3.0	4.0
Purpleheart	3.2	6.1
Rosewood, Brazilian	2.9	4.6

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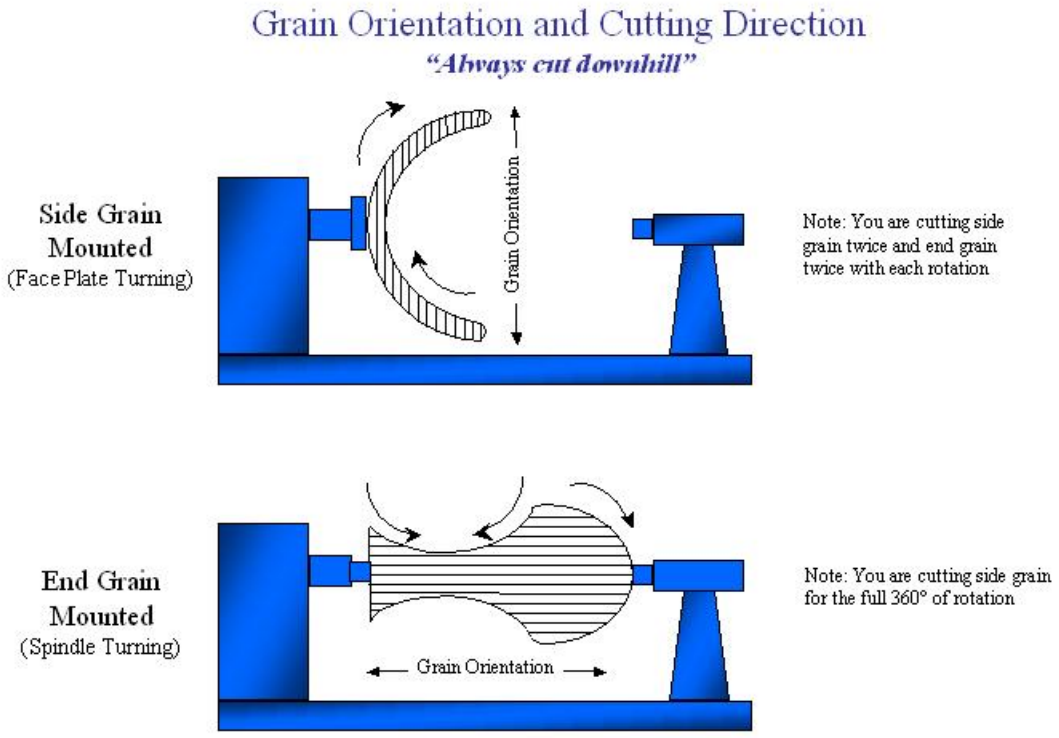
Direction of cuts

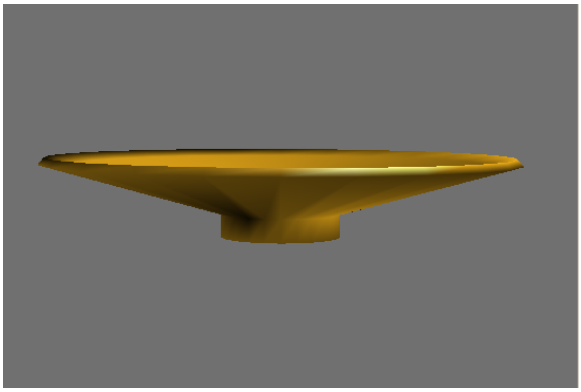
When making cuts we try to cut “downhill to the grain.” This is the direction in which the fibers being cut are more supported by the un-cut fibers below. The supported fibers cut more cleanly resulting in less tear out, smoother cuts and the final effect – less sanding.

In spindle turning “down hill” is towards the center of the work. In bowl turning “down hill” will be a function of how the blanks is oriented on the lathe. Most side grain bowls appear as indicated in the illustration. In end grain vessels the down hill cut is similar to cutting in spindle turning, e. g., towards the center of rotation.

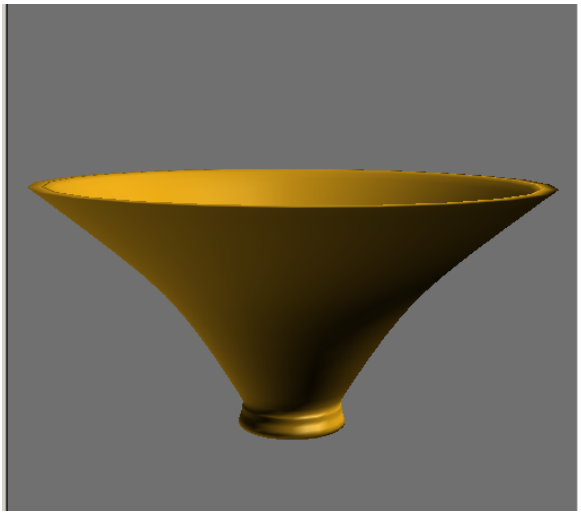


Basic Shapes - Bowls

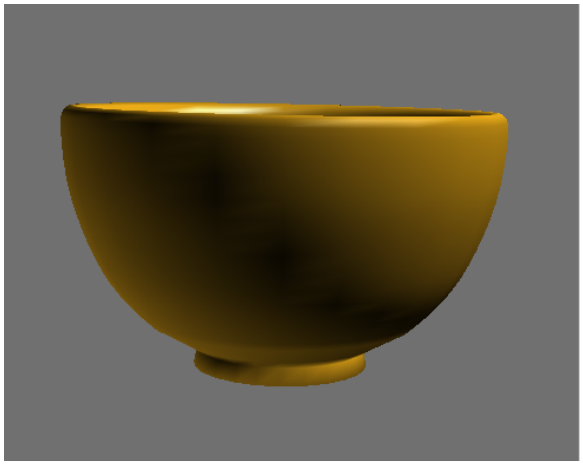
Straight line



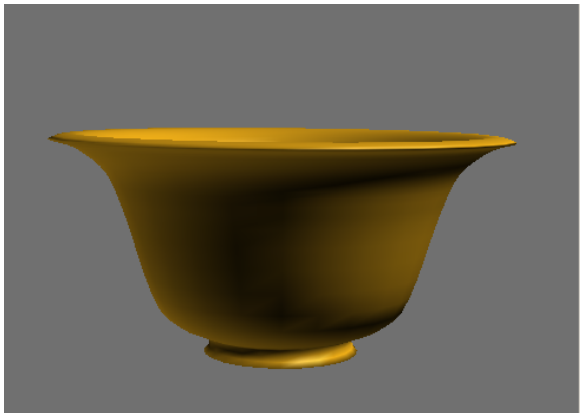
Continuous negative curve.



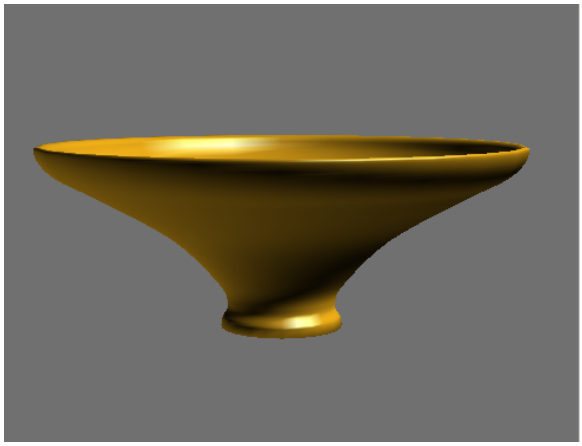
Continuous positive curve



Ogee curve A



Ogee curve B



Sung Dynasty ceramic bowl

Kelly Dunn Norfolk Island Pine bowl

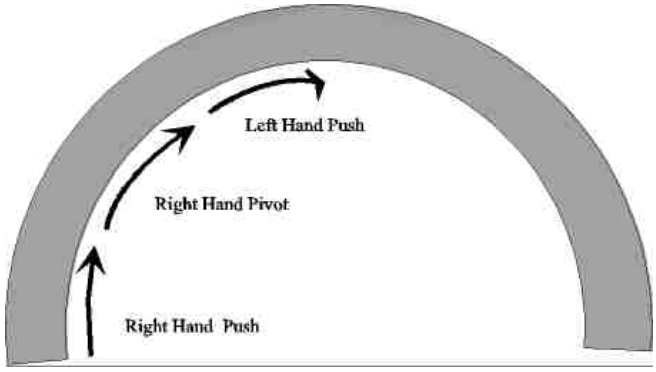
The Three-Part Bowl Cut

There are many techniques for forming the interior of a bowl. It seems that each demonstrator has their own reason for why their method works better for them and why.

The following technique is useful for new turners to use the bowl gouge to successfully complete the turning of a bowl. My method of instruction provides only one tool technique that is somewhat independent of gouge bevel angle, is low risk for catches, and can be used on almost any depth of bowl.

There are other cuts that are added to the arsenal of techniques as a learner's skill improves; but to begin the new turners needs to master this one technique.

Right hand push, Right hard pivot, Left hand push: this combined with a rotation of the right wrist between the first and second components make an easy technique to learn and is safe for a novice.



Take it one component at a time:

Right Hand Push This cut engages the operator with the bowl and establishes a shoulder to support the bevel and cuts down the side of the bowl.

The bowl gouge is held at a 45 degree angle *behind* the lathe bed with the flute positioned to face horizontally away from the operator. The operator's right hand is clamped to the tool in an extreme clockwise rotation with the wrist in a vertical position. The left hand is stationary holding the tool in position.

The edge of the gouge is place against the bowl interior and the right hand pushed into the bowl. The edge catches a small shoulder and the cut proceed downward. When the tool cannot proceed further the operator moves to the second part of the cut

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Right Hand Pivot This transitions from the wall (vertical) cut to the bottom cut around the corner and into the bottom cut

Without releasing the initial grip, the right hand pulls forward to a position parallel with the ways of the lathe; at the same time the wrist rotates into a more natural and comfortable forward position. The left hand remains stationary. The tool has now rotated approximately 45° with the flute facing about 2:00 o'clock.

What happens inside the bowl is the tool rotates to a 45 degree angle relative to the wood fibers while pivoting around the inside corner.

Left Hand Push The right hand remains stationary parallel with the ways and the *left hand* pushes the tool away from the operator.

During this portion of the cut the tool moves horizontally across the bottom of the bowl in a relatively flat cut.

The flute is still facing 45 degrees to the wood fibers.

The reason I have adopted this technique simplifies the tool rotation and eliminates the general concerns related to cutting the inside corner where most catches occur. The technique can be modified to make a more rounded bowl bottom by continuing to pull the right hand forward during the third phase *left hand push*. This pivots the tool around the left hand and creates a rounded bottom.

After this technique is mastered (or at least under control) I add another interior cut. the *shearing* cut.

Position the flute in the direction of the cut and the back of the bevel against the bowl's interior. Rotate the tool counterclockwise until the first dust of shavings appear and proceed to push the tool downward tracing the line of the cut desired. This cut produces a smoother interior and can be use as a final shaping or finishing cut.

Although this cut is easy it can also be dangerous if the tool is over rotated. The exposed cutting edge becomes too open and engages along it full length and bites in very deeply becoming a catch.

Stabilizing green wood

If you have ever turned green wood from our “urban forest” you have most certainly encountered issues with movement and cracking as the wood dries.

As wood dries free water is released reducing the moisture content; then as cellular water starts to be released the cells begin to shrink. The wood structure also shrinks mostly radially around the ring structure, to a lesser extent tangentially across the ring structure and very little along the length of the grain. Each species behaves differently and to a greater or lesser extent. What we try to do is prevent the uneven shrinking from tearing the wood apart, generally along the medulla rays or other weak areas across the ring structure.

Slowing down of the drying allows more time for the wood to move and equilibrate the internal stress and *not* crack. Here are several different techniques in regular use to address the problem:

Stabilizing the green rough turned vessel

Proper rough turning
Turning to a uniform wall thickness is very important to equalize the drying. Be sure to address the tenon and foot areas which many times left too thick thus allowing cracking to occur in this area. As a rule I leave a wall thickness of 10% of the vessel diameter

Proper storage
Storage is important to reduce stress during the drying process. I pack the roughed out vessel with some of its own chips, then place it in a one or two brown Kraft paper bags, label, and date it. Store the vessel in a cool location which has good air circulation.

As the vessel dries and begins to loose moisture you can move it to a warmer location. Typically I would start out placing the wrapped, sealed vessel on the floor in a corner and later move it onto a shelf then up the shelves to the top location. Drying can still take from weeks to months. Regularly check moisture content with a moisture meter or by regular weighing.

Sealing end grain
Separately or in addition, seal the end grain of the bowl or vessel to prevent more rapid drying through the open end grain fibers. Rapid end grain drying will introduce stress as the end grain dries and shrinks while side grain areas of the vessel have not moved. Wax, paraffin, paint all will work.

Finish turn the vessel and add finish
As an alternative complete the turning to final dimension as rapidly as possible, sand, and finish. Sanding can be difficult with wet wood as the process loads the sand paper, raises the surface temperature of the vessel and may lead to small surface fractures. Try wet sanding with water and slower lathe speeds.

Finish with a penetrating finish inside and out, load the vessel until it cannot absorb more finish; wipe away the excess and set aside to in a cool airy location. Repeat until the desired finish is achieved.

Now if you want to manipulate the vessel and possible speed up the process try one of the following methods:

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Water replacement processes

Pentacryl and PEG 100 (polyethelyene glycol 100) displace the free water with heavier molecules which remain in the cells preventing the shrinkage. The wood is soaked in the solution until all the water has been osmotically replaced, sometimes 2-3 months. The weight may actually go up as these molecules are heavier than the water being replaced. Finishing techniques may also be affected due by this technique.

Some recent experiments suggest that soaking in denatured ethanol followed by careful drying may also reduce the loss while shortening the total drying time. Deformation is still possible.

Cell rupture processes

Boiling, freezing, and soap soaking all seem to allow the cells to release the cellular water more easily by fracturing the cell membrane and releasing the trapped water.

The soap process is usually made of the cheapest liquid detergent cut 50/50 with water. Soaking can be from a few days to a few weeks. The seriates in liquid detergents are very similar to the material forming the fiber walls thus weakening the fiber's bonds and opening the structure and allowing water to pass through.

Freezing also address the issue the cell walls since water at 4 degree C actually expands rupturing the cell walls. Freezing is done two different ways:

1) The rough turned vessel is frozen, thawed, and then turned after a day or two.
2) The vessel is frozen and left in the freezer until the frozen water has desiccated and the vessel is dry. Some shape change takes places but the cracking is reduced. Desiccation is a function of the size of the vessel and will take months. It's like evaporating ice cubes.

Green wood turning is inexpensive, forgiving to the tools, and with the wood movement – exciting.

Remember: "wood is cheap"