

# Advanced Bowl Turning Techniques

Course number 95744088



**Mt. Diablo Adult Education**

A division of the Mt. Diablo Unified School District  
Serving Life Long Learning

One Santa Barbara Road, Pleasant Hill, CA 94523 (925) 937-1530



## **Rules of classroom conduct**

- **Always maintain a safe work environment for yourself and others**
  - **Always wear safety glasses or face shields as required**
  - **Advise instructor of any safety concerns or issues**
- **Clean up at the end of each class**
  - **Your work area/lathe**
  - **The class room floors and tables**
  - **Sharpening center**
  - **Replace all tools/accessories into the proper location**
- **Always sign in on arrival**
  - **Advise instructor if you plan on leaving early**
- **Be responsible for your own personal tools/equipment**

## ***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 wenchers 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.

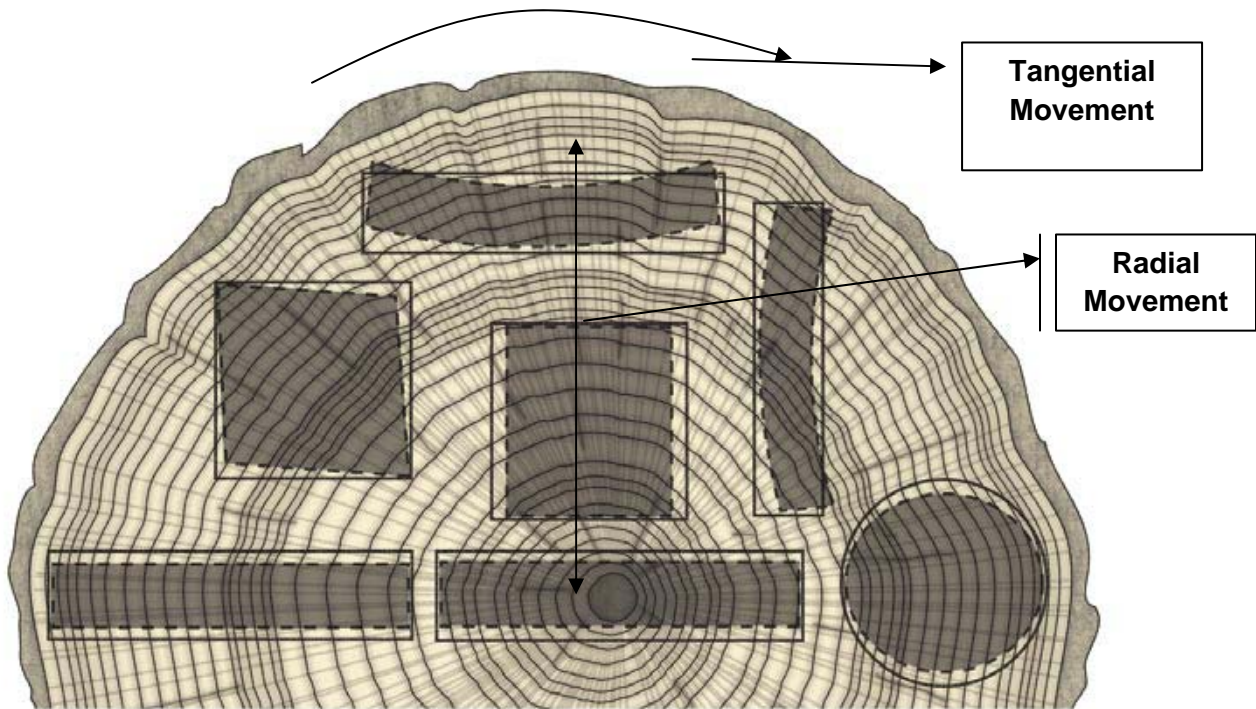
Adopted by Bay Area Woodturners Association, 10 March, 2001

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



- $H_2O + CO_2 + \text{nutrients} = C_6H_{12}O_6$  (Glucose) +  $O_2$  in the presence of Chlorophyll & sunlight in the leaves
- The inner bark transports the glucose to where growth takes place,
  - Roots and stem tips
  - The Cambium layer creates new sap wood by forming cellulose and hemicellulose 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
- Heartwood 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 %
  - Hemicellulose – 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 leaf 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

## Wood movement



Wood species	% Radial shrinkage	% Tangential shrinkage
<b>Domestic hardwoods</b>		
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
<b>Domestic softwoods</b>		
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
<b>Imports</b>		
Bubinga	5.8	8.4
Cocobolo	3.0	4.0
Purpleheart	3.2	6.1
Rosewood, Brazilian	2.9	4.6

## 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:

### **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.

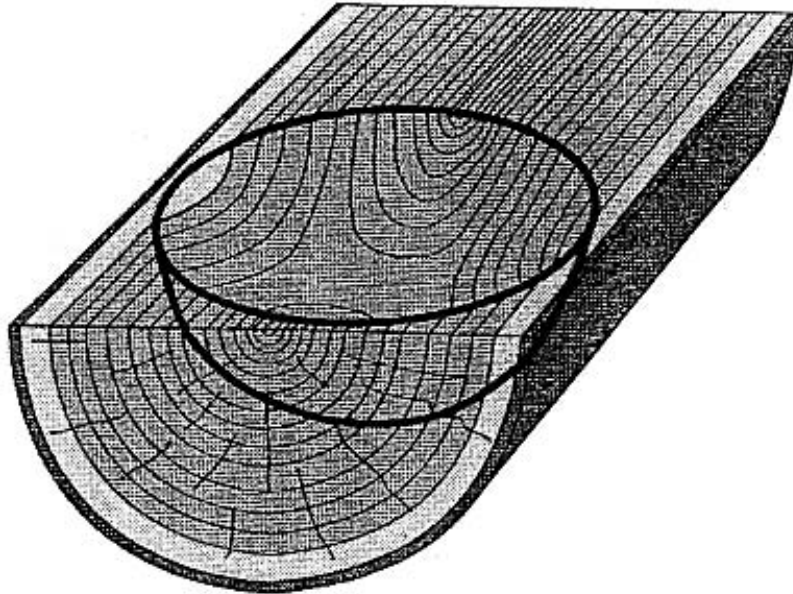
Freezing also address the issue the cell walls since water at 4 degree C actually expands rupturing the cell walls. Freezing is done two different ways:

- 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.

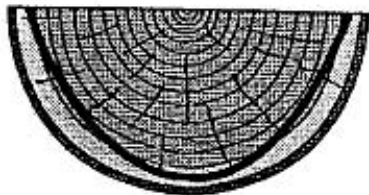
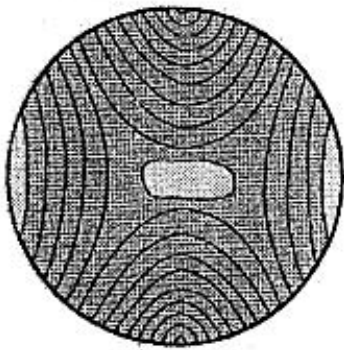
Green wood turning is inexpensive, forgiving to the tools, and with the wood movement – exciting.

Remember: “wood is cheap”

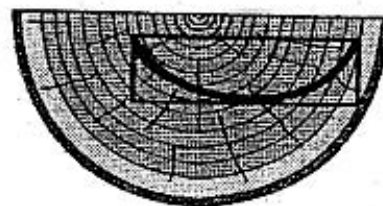
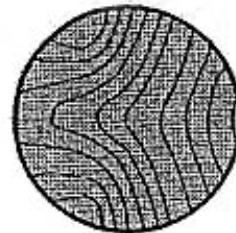
# Bowl Forms



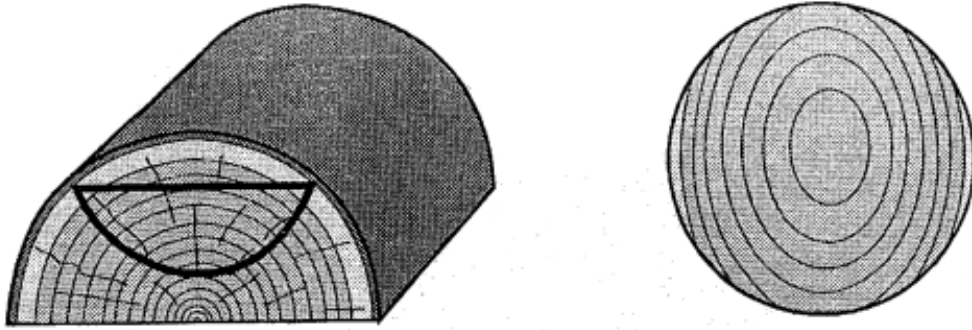
An open form turned with the pith at the rim will display a hyperbolic pattern inside.



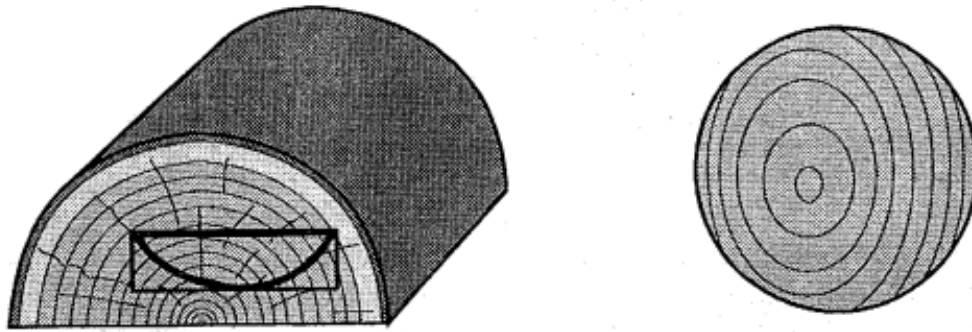
A bowl form in which the rim and bottom cut into the sapwood will show white patches at those points.



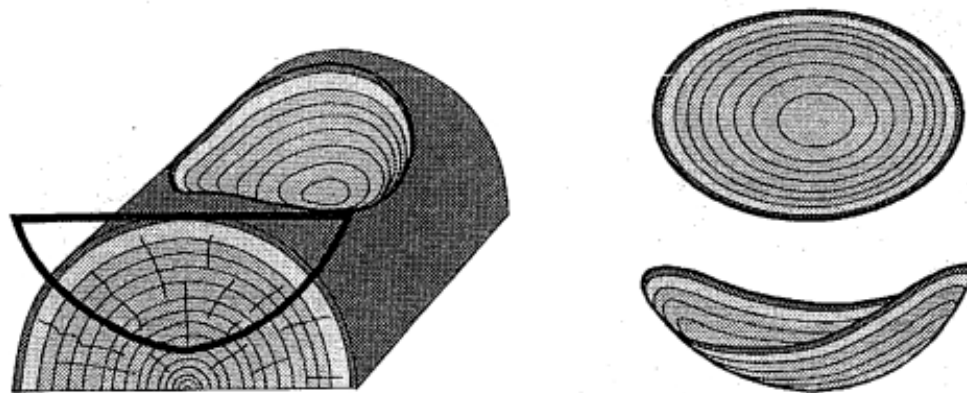
Boards in which the rings are not centered will have the pattern shift toward the pith side.



Open bowls turned with the pith at the bottom will display a concentric oval pattern. The outermost rings will be broken due to the flat rim being cut through them. If the edges cut into the sapwood, a sapwood streak will show at each edge.

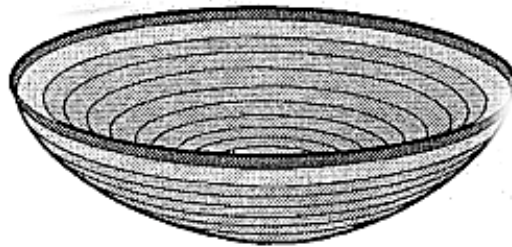
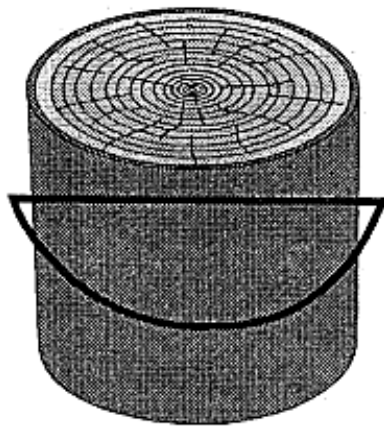


Bowls turned from boards where the pith is off centered will create an off centered pattern.



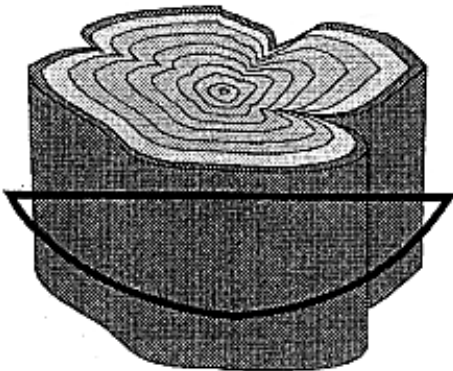
By extending the open form through the bark, an oval shaped bowl with an undulating natural rim will be produced. All the rings will be whole because none of them were cut off by the flat rim.

© Todd Hoyer



An open form turned from the whole log with the pith at the bottom will have a concentric circular pattern. If the form extends beyond the bark, there will be a natural edged bowl.

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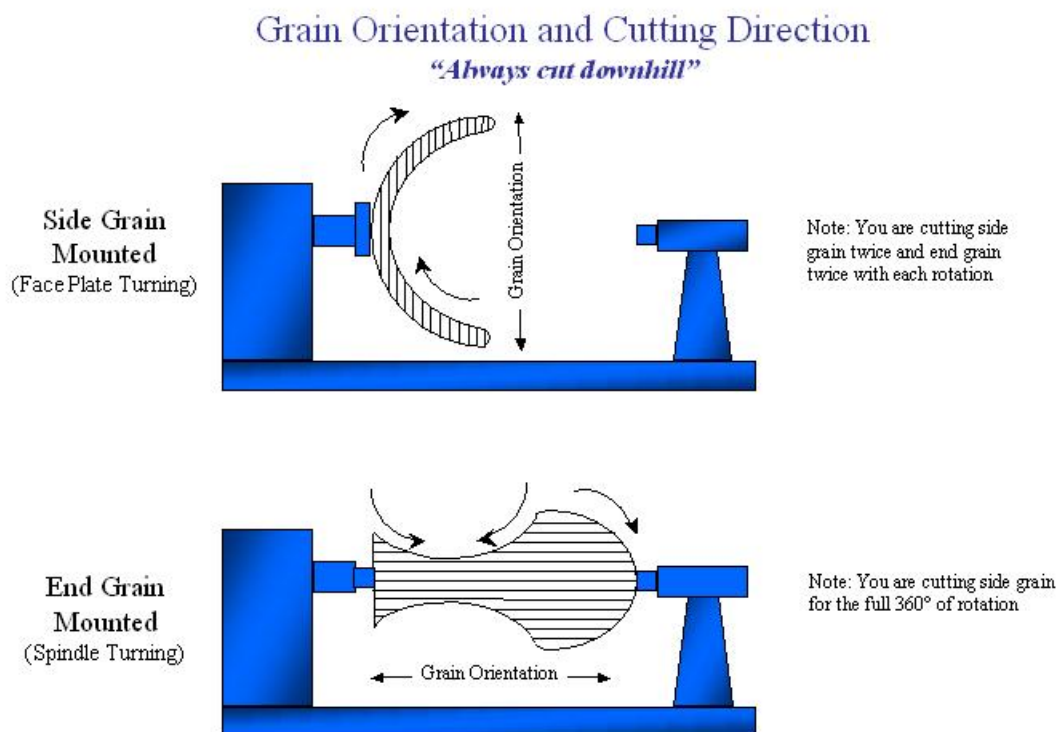


If the log is convoluted, the bowl form will have a scalloped edge.

© Todd Hoyer

## 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.

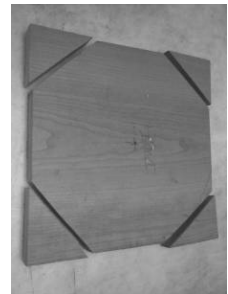
# Turning Your First Platter

Here is one way to turn a platter using the minimum of lathe fixtures & accessories:

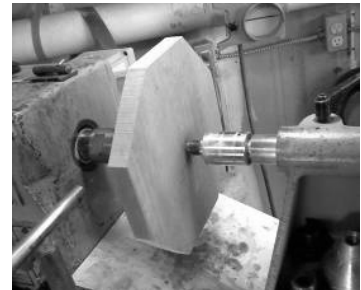
1. Prepare a face plate and glue block
  - a. Make the glue block dead flat and sanded



2. Cut blank of one inch thick stock to fit your lathe
  - a. Mark the center on both sides
  - b. Remove the corners
  - c. Sand face side dead flat for gluing



3. Glue face side of blank to the glue block
  - a. Use the tail stock for alignment



4. Using a deep-fluted gouge, carefully round the edge of the blank



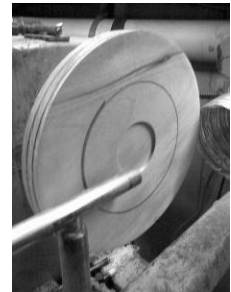
5. Flatten face and back of blank with deep-fluted gouge



6. Lay out project
  - a. Mark depth of rim, bowl and foot on edge of blank
  - b. Mark diameter of foot on base side
  - c. Mark diameter of recess for selected chuck



7. Cut recess to fit selected chuck's expanding jaws
  - a. Be sure recess is not more than 1/8 inch deep
  - b. Recess must be shaped to match the expanding chuck jaws
  - c. Sand the recess interior to completion



8. Turn bottom of bowl and rim sections
  - a. Complete and sand



9. Shape edge of platter interior
  - a. Complete the interior of the rim
  - b. Sand to completion



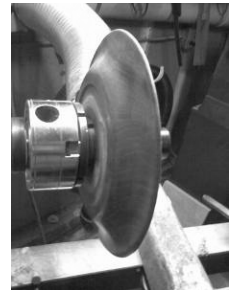
10. Reduce interior of bowl area to near the glue block if possible

- a. Watch thicknesses carefully



11. Reverse platter into the expanding chuck

- a. Do not over tighten jaws



12. Remove faceplate carefully

- a. Reposition tailstock to support project



13. Reduce glue block to approximately 1/2 inch



14. Reduce interior carefully

- a. Constantly check thickness of bowl area



15. Level out interior
  - a. Completely remove glue block remnant
  - b. Complete interior
  - c. Check flatness with a straight edge



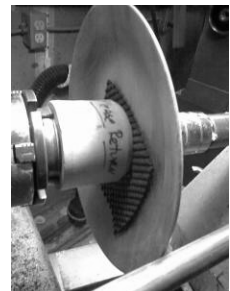
16. Sand and complete interior
  - a. Add finish



17. Reverse and complete the base
  - a. Using "jumbo jaws" with your chuck



18. Using a jam chuck with rubber pad



19. Remove point from live center and add a hard rubber block
  - a. Readjust platter position to center perfectly and tighten the tailstock
  - b. Remove excess stock from base, sand, finish



Here are some videos that may also be helpful:

<http://www.woodturningonline.com/Turning/Projects/plates.html>

<http://www.youtube.com/watch?v=ip0ThPqIqJY&feature=related>

<http://www.youtube.com/watch?v=udj9euwBEVE&feature=related>

# Platter Turning Instructions

by Dale L. Nish

Platters are a very useful woodturning project. They are typically turned from wood 1 1/2 to 2 inches thick and are usually 12 to 16 inches diameter. Typical uses are for serving crackers, cookies, etc. These instructions are for use with a screw center faceplate, but a regular faceplate screwed to the top of the platter would work just as well.

## STEP 1

- a) Drill a 1/4" hole 3/4" deep for a platter 1 3/4 - 2" thick.

5/8" deep for a platter 1 1/2" thick and use a 1/8" thick shim washer between the faceplate and the wooden disc.

- b) Install the screw center faceplate onto the lathe, and screw the platter onto the screw.

The platter should be firm against the faceplate. For increased safety and to decrease possible vibration, I suggest moving the tailstock and revolving center into position to support the platter while turning up the edge and roughing out the back of the platter.

- c) For a 12 to 14 inch platter, set the lathe speed at around 500 rpm.



## STEP 2

- a) True up the edge of the platter.

- b) Face off the bottom of the platter.

- c) Layout the dovetail recess which will receive the chuck jaws in the expansion mode.

The recess is 3 1/2 - 4" diameter and 1/4" deep.

- d) Remove the waste wood from the dovetail recess with a small gouge.

- e) Clean up the corners and cut the 5 degree dovetail angle.

Use a skew chisel flat on the tool rest and used as a scraper, long point cutting and forming the dovetail.



## STEP 3

- a) Turn a foot ring around the recess area.

The diameter of the foot ring should be about 1/2 the diameter of the platter.

- b) Turn the platter to rough shape.

- c) True up both sides of the outside rim of the platter.

This will tell you how much thickness you have to work with before you turn the rim to final shape and thickness.

- d) Complete the outside shape of the platter.

- e) Design the rim so it feels comfortable in your hand.

- f) Sand and finish the outside of the platter, including the recess.



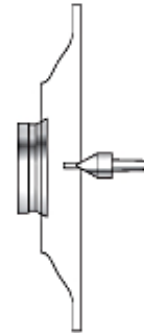
## STEP 4

- a) Remove the platter from the screw center faceplate.

- b) Install the expanding chuck on the lathe.

- c) Fit the platter to the expanding chuck. Tighten securely.

- d) Move the tailstock with the revolving center into the support position.



## STEP 5

- a) Turn the inside of the platter with a 1/2" bowl gouge.

Shape the rim area as desired.

Remove most of the material down to the center, then move the revolving center and remove the rest of the wood.

- b) Turn a gentle, pleasing curve from the rim to the bottom of the platter.

The bottom should be flat or have a shallow concave curve.

- c) Measure carefully for depth.

Leave 1/4" or more wood above the dovetail recess.

The most common error in turning a platter is to get the bottom area over the dovetail recess too thin!



## STEP 6

- a) Sand and finish the inside of the platter.