Introduction to Wood Turning

Course number 95501001

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

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

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

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

Introduction to Wood Turning
Participant Handout

Class schedule

Week one	**Course introduction** Course orientation Roughing out between centers with the spindle roughing gouge Basic cuts with the skew chisel Beginning practice with the shallow fluted gouge
Week two	Continue practicing with the shallow fluted gouge Sharpening 101
Week three	**Projects to Build Skills** **Turning a screw driver handle** **Turning bottle stoppers** **Pen Turning – The 7 mm pen** **Turning a bud vase from a drawing**
Final week	**Complete all project or revisit your favorite activity** **Lathe maintenance activity**

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

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

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.

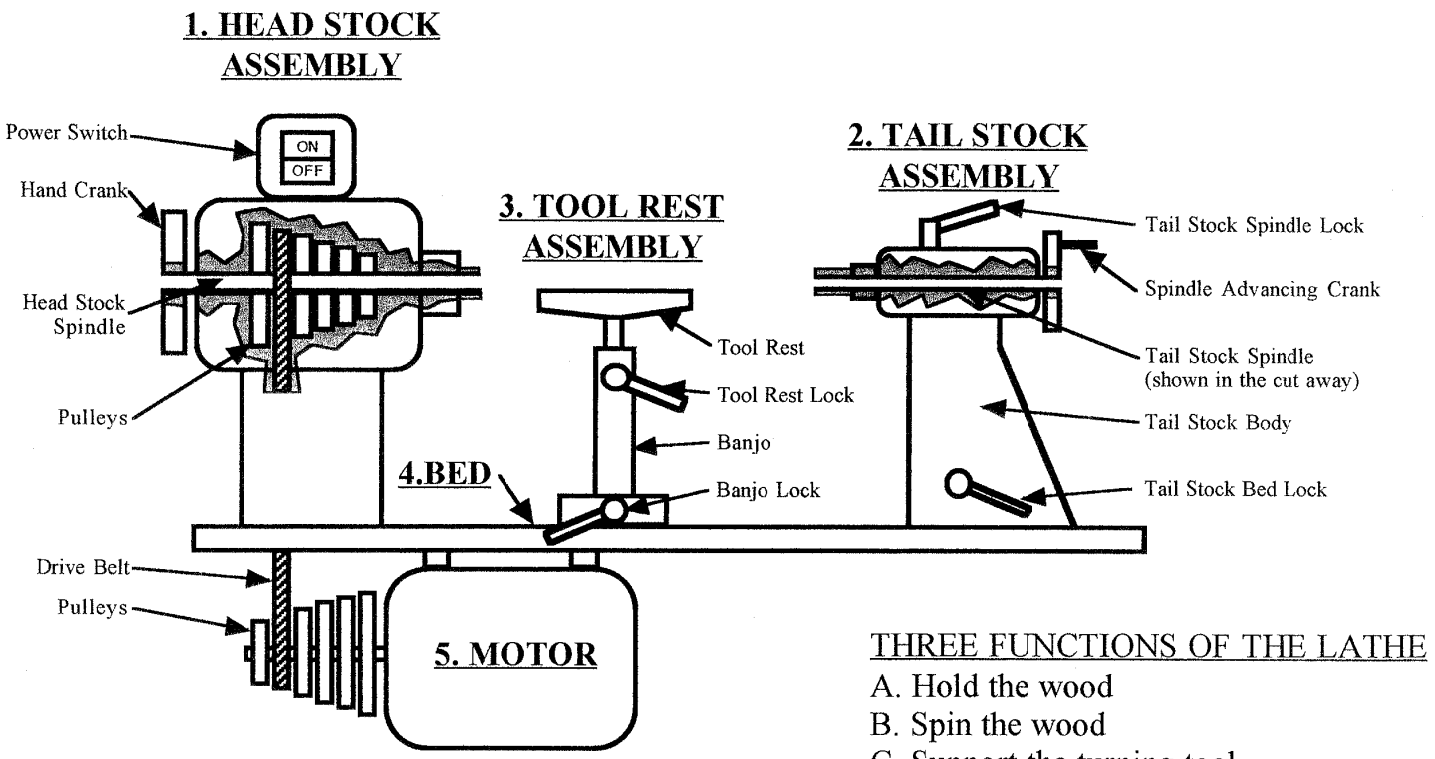
When finishing, always remove the tool rest. Use only paper towels, never woven fabric. On exterior surfaces, apply the towel to the underside of the piece with the wood spinning counterclockwise. On interior surfaces, apply the towel in the lower left-hand quadrant also with the wood spinning counterclockwise.

Adopted by Bay Area Woodturners Association, 10 March, 2001

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

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

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 and relaxed 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 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."
    c. When ion doubt – sharpen.
5. Not recognizing that you have to "pay your dues."
    a. Doing it again to improve lathe/tool/body operation is called "practicing." We 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

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

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

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

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

- **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.

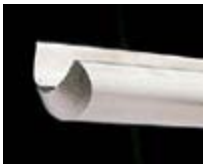
Produced by
JL Rodgers, Inc – 236 Briar Drive – Martinez, CA 94553

THE Spindle Roughing Gouge, the "SRG"

The spindle roughing gouge is the first tool that most turners first touch and is easy to develop confidence with. With that confidence sometimes come overuse and mis-application.

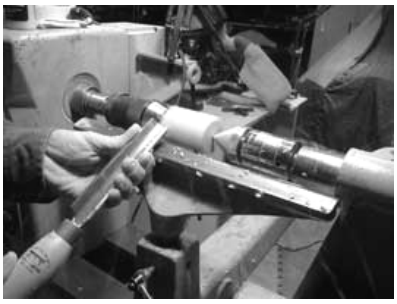
The "SRG" is named *spindle roughing gouge* to indicate that this tool **is not** for use for roughing out bowls or any hollowing application! This misuse has led to so many cases of injury that the American Association of Woodturners renamed the tool to help better define its specific application.

The tool is ground with a square shoulder at about 45 degrees so that is can be used to turn a spindle round right up to a pommel shoulder or other square apron. The tool can be rotated to use *all* the edge rather than sharpening frequently.



Place the tool squarely at 90 degrees to the work, hold the handle to your body and shift your weight from one foot to the other to advance along the work piece.

Most problems I have noted are:



1) Failure to hold the tool square to the work leading to the tool catching a shoulder and running off in the opposite direction
2) Failure to start the cut with the handle low enough to "rub the bevel" resulting in tearing fibers rather than shearing them
3) Not working toward the end in a sweeping cut potentially causing a catch at the end of the work piece
4) Poor body position not allowing for sweeping, smooth cuts by transferring weight from one foot to the other
5) Holding the tool against the tool rest too tightly causing the tool to drag and jump during the cutting - not moving smoothly.

Sharpening the tool is simple as placing the handle on the grinder platform, aligning the bevel to the face of the wheel and rotating the handle smoothly. Assure that the tool is not over-rotated which will cause the square shoulder to be rounded over.

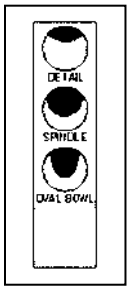
The tool is less important than the rounded edge can only touch the work at a single point no matter how big the tool is. I particularly like the tool from P&N as it is milled from a solid piece of bar stock rather that forged from a flat sheet of steel – more mass, less vibration and more smoothness.

Use it on spindles only; there have been too many snapped tool tangs due to their misuse on non-spindle projects.

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

The Shallow Fluted Gouge
(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.

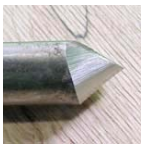


When manufactured the depth of the flute varies and in most cases is about half way through the diameter of the shaft. Those tools that are forged have the flute held higher in the steel and can therefore can be ground into more severe angle for use in detail work.

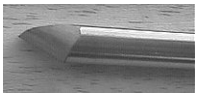
There are three typical grinds:

- 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. The solution is practice.

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 cuts 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 in hollow form of reasonably shallow depth. Working it too deep and the tool is not stiff enough to prevent vibration.

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

The Skew Chisel

The many types of skew chisels can be easily groups by several criteria:

- Oval stock 
- Rectangular stock 
- Straight or radiused edge

We prefer the skew chisels made from rectangular stock as we believe the oval bodied skews are too thin at the points causing excessive vibration, difficult to stand straight on a tool rest for "V" cuts, and are more difficult to sharpen since you can't lay them flat on the grinder platform.

The general rule of thumb for shape suggests that the width of the bevel should be 1.5 times the thickness of the stock (shaft) and roughly at a 70 degree angle to the shaft. The tool edge on the long point side should be flat and the edge on the shorter point side should be rounded over.

On the radiused skews the first 20% of the edge starting from the long point should be horizontal and perpendicular to the shaft for better peel cuts (more later of these cuts). The balance of the edge than is rounded as is illustrated in the Lacer skew above.

Radiused skews are more forgiving for planning and beading cuts for the beginner; however the straight skews have a finer long point for better detail work. Also the straight skews will allow the long point to be more visible when making cuts.

A small trick is to slightly chamfer the corners near the long point. This helps to prevent some of the catches than can occur when rolling a bead. It does work!

We prefer a skew chisel of about ¾ inch width is more flexible for many tasks, from cutting beads to pen turning. Wider skews work better in roughing cuts and planning cuts and on larger work such as Newell posts, chair spindles, etc.

Most newly purchased skews have rather sharp edges which must be softened to allow the skew to slide easily along the tool rest with out digging in. The tool edge near the short point may also need to be radiused.

This is also the one tool that it honed after grinding. First use a 600 grit DMT diamond plate to perfect the edge and then strop on a rouge-charged leather strop. Bringing the edge back usually requires only re-honing or even just re-stropping.

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

Skew chisels – continued

Wood turners should know that there are many different uses for this tool planning, shaping, parting ,,,

The three most popular cuts are also the basis for the more advanced cut; master these, increase your productivity and more on.

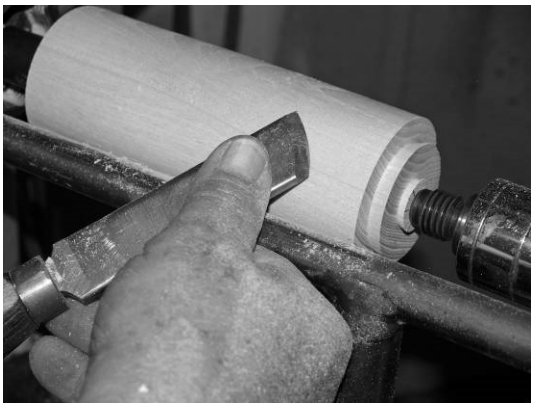
Peel cut

The tool is laid down on its side with the long point facing the wood and the tool rolled into the wood similarly to the use of the parting tool. This cut is very safe to perform as long as the bite size remains small. This removes a lot of wood fast but not very cleanly – the cut will have to be cleaned up.

If the skew is a straight-edged skew the resulting cut is dovetail shaped and useful for chuck tenon requiring a dovetail shape.

If your skew has a radiused edge with the first ¼" ground horizontally, the peel cut will be flat and not jagged. This tool ground in this fashion can be used to clean up a badly frayed knot if applied lightly and in a scraping mode.

Planing cut



The cut is a means of cleaning up a roughed out a billet and flattening out "hills and valleys" left by the spindle roughing gouge.

For ease of use the tool rest is raised so that the cutting edge rests against the spindle at about 11:00 o'clock. Remember place the tool against the tool rest with the bevel resting against the spindle. Raise the handle slowly to bring the front edge of the bevel into contact with the wood. Note that the handle also rotates slightly as the bevel comes into contact – allow this to happen.

As the handle is raised, the edge of the tool contacts the spindle surface; some "dust" or small shavings will appear at the cutting edge. *Do not raise the handle further.* Lock the tool to your body and move horizontally along the spindle without readjusting your body or tool position.

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

Parting Tools

For such a simple tool there are so many different kinds, shapes, widths, etc. The tool is used for separating projects from their support, establishing dimensions, making tenons, and even turning beads.

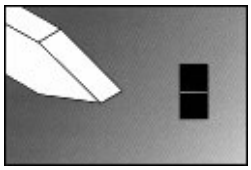
Presenting the tool to the work can be either a bevel rubbing or scraping action depending on how the turner places it.

Many parting tool (like examples 1 – 3 to the right) have a bevel below the cutting edge and should be presented as a cutting tools: rub the bevel and raise the handle to cut. This presentation will give the cleanest wood removal. With wider bevel tools they can also can be rolled to cut spindle beads.

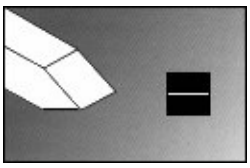
Examples 4 and 5 are negative rake scrapers in which the tool is pressed against the spindle fibers to be cut and pushed inwards at the center line of the project.
Here are some of the options:

Here are some examples:

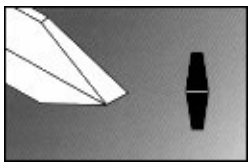
1. The standard parting tool. The edge is square to the shaft and centered. Being a double edged tool it can cut equally well from either face. When using this tool, always make a pair of overlapping cuts to prevent the tool binding in the wood. Sharp edges of the shaft can be relieved to protect the tool rests.



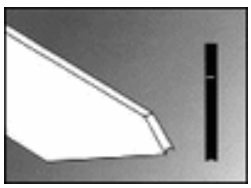
2. The Beading and parting tool. This tool looks similar to the one above but wider in breadth and can be used to roll beads quite well by always keeping the bevel in contact with the wood. These tools can be used for making tenons for chucks; their extra width speeds the process of getting a flat, square tenon. Remember the overlapping cuts!



3. The diamond parting tool. The diamond shape allows only the cutting edge to be in contact with the wood. The rest of the shaft is relieved to keep the tool from binding during the cut. Be sure to sharpen equally from both sides to keep the edge in the center.



4. The fluted parting tool. This tool is designed to allow the two flutes to slice through the wood while the center scoops out the waste. The expectation is that the cut will be cleaner and with less effort.



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

5. The tapered and fluted parting tool. This tool adds more mass to the thin fluted tools to stabilize it more and reduce vibrations. Being tapered to the cutting edge, the shaft is clear of the wood and should bind less frequently.

Here are few hints for using the parting tool:

- Allow clearance so the tool doesn't bind. Make two overlapping cuts. As you progress alternate between these cuts to keep the tool from binding.
- When sharpening, keep the cutting edge square to the shaft. We want a clean parallel cut on the wood than can only be achieved with a square edge.
- Have two parting tools, a thinner one to part off with and a wider one to cut tenons and roll beads.
- Longer handles on larger parting tools allow for more support of the cut and are important when doing the one handed parting cut.
- Practice parting off spindles one handed. Keep the tool shaft against your forearm for better support.
- If you think you can't catch the parted off piece, don't try. Reduce the tenon and then cut the work free with a saw.
- If parting off a spindle project, plan the work so that the parting off cut is near the headstock not the tail stock. In this orientation the work stops turning when parted off and doesn't fly away.

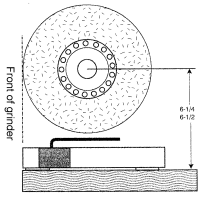
Produced by
JL Rodgers, Inc – 236 Briar Drive – Martinez, CA 94553

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 maybe some reshaping also.

Using a fixture to assists us by allowing us to repeat the desired angle and 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 3/8" 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. Many 8 in grinders will require a ¾" plywood spacer to raise it's height an appropriate distance.



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.

Illustrated at the right is a fixture that resets that distance of the fixture 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.

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)

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

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 grinder:

- Keep sharpening wheels clean and true
- Use light touch (sharpening not regrinding)
- Tools 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
- *Never place your hand between the fixture and the grinding wheel.*

We prefer slow speed (1750 RPM) grinders because they heat the tools less. Grinders should be equipped with Al_2O_3 (aluminum oxide) stones. These wheels 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 an un-mounted wheel 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.

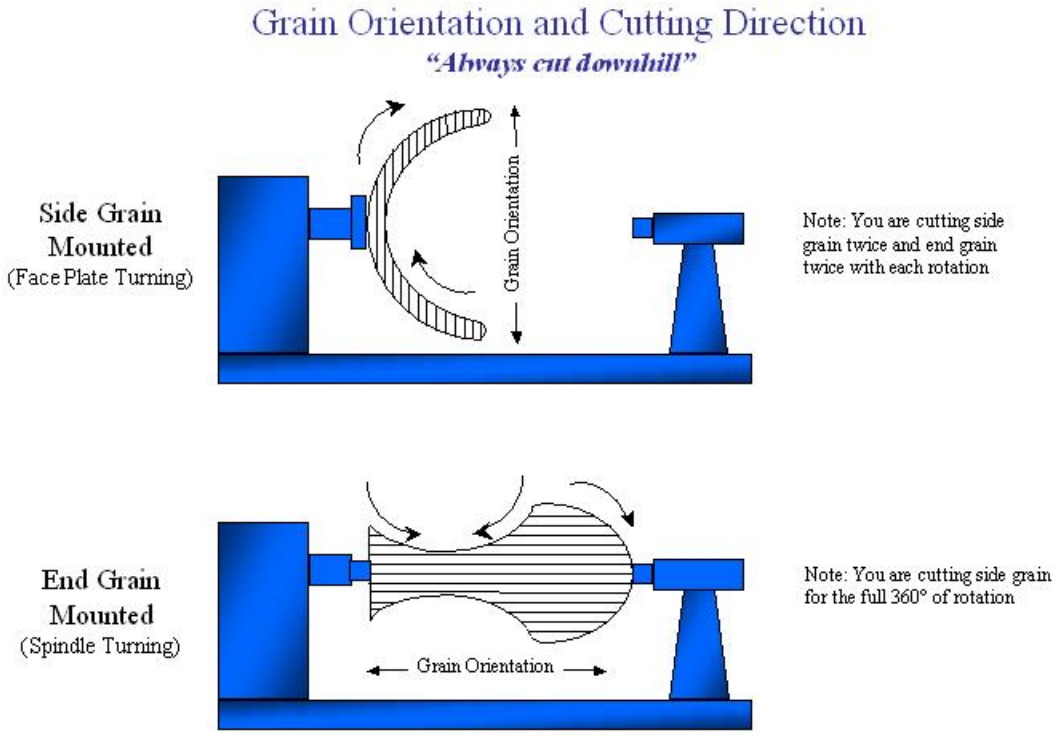
After mounting the wheel, grinder vibration must be reduced. Rotating the new wheel to counter balance it helps. Truing the wobbly surface also is important. Note: *Always wear a dust mask for these operations)* Rest the diamond truing tool on the grinder's platform and lightly touch it to the wheel.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

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

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 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 downhill cut is on the exterior similar to spindles – downhill is toward the center; on the interior downhill is center outward.

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