Stuart Batty

Stuart Batty
Boulder, Colorado
213-453-2423
stuartpeterbatty@gmail.com

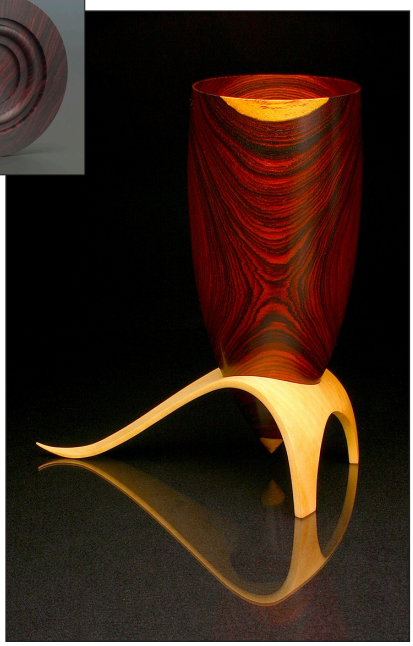
Stuart is a third-generation woodturner, being a full-time production turner and teacher in his father's studio at age 16. At 19, he started working for Craft Supplies in England, at the time the world's largest supplier to woodturners. During his 6 years at Craft Supplies, he was the in-house woodturning teacher and demonstrator. He set up Craft Supplies' first sawmill and was in charge of their import business that sold more than 300 exotic woods around the world. Stuart also developed and tested woodturning tools for Robert Sorby, a Craft Supplies sister company.

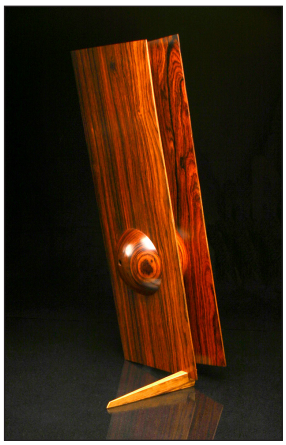
During the past 34 years, Stuart has taught more than 3,000 amateur and professional woodturners. He has demonstrated and taught in 12 countries and for more than 180 AAW chapters throughout the US.

Stuart's style of work is greatly influenced by his background as a spindle turner with precise cuts and sharp detail. He uses very simple tools and tool shapes to create his pieces. His work is pure lathe work, with no carving or surface texturing.

Stuart's artwork has been sold through prestigious galleries across Europe and the US. He also has artwork displayed in the permanent White House collection.

Stuart believes we have only skimmed the surface of the potential of a wood lathe. With production woodturning as his background, his foundation in woodturning helped him perfect the push cut style and other useful techniques, such as negative rake scraping.





Perfecting the Cut

The goal of this information is to improve the understanding of what constitutes perfect cuts in woodturning. I am convinced that perfecting puts is possible for all woodturners. Hopefully the information in this paper will enable woodturners – with some practice – to achieve Perfect Cuts. Practicing the correct techniques is the key.

Download 34 free high-definition videos that support this article from https://vimeo.com/woodturning/videos.

* * *

What are perfect puts in woodturning? They are consistent cuts made by a woodturner who demonstrates effective tool control, cuts easily and with very little physical effort, and produces any desired shape in any kind of wood – hard, soft, even spalted – all with no torn grain and no catches. Perfect cuts reflect effective tool control.

Many woodturners around the world work at this level every day, and they are not all professionals. They work with very little conscious thought because the vast majority of their techniques are performed subconsciously. They probably have been turning like this for many years, and conscious thoughts control only basic decisions like shape, how much wood is removed, and how quickly the cutting takes place. At first even they found that mastery of the tools was difficult because there was so much to learn initially, and all that initial learning was based on conscious thought rather than subconscious action. If correct methods are not learned from the start, bad habits are stored in the subconscious, and it is very difficult to break these habits and learn correct methods.

I was fortunate in that I was taught correct cutting methods at a very young age. I served an apprenticeship under my father Allen Batty, but anyone can learn these methods from a qualified instructor. My personal quest is to teach others these correct cutting methods so they turn more proficiently. By refining and breaking down the fundamental cuts into smaller increments and explaining them in a way that is easily understood, I regularly achieve that goal. I instruct a small number of students (typically about 5 or 6 students) in sessions that last between 2 to 5 days. One-day classes are not as effective because repeating the fundamental cuts during at least a second day causes the subconscious to start to "kick in" and cement the learning into muscle memory (subconscious action).

Practice does not lead to perfect woodturning right away, but practicing correct cutting methods leads to perfecting technique, which eventually leads to turning becoming easier and more fun. An imperfect technique may work quite well, at least for a while, but using imperfect techniques long term is ineffective and fails to foster continuous improvement.

So what are perfect cuts? I will explain in words, but doing so is obviously not as effective as participating in a hands-on class. But, it is a start. For those who have taken a class with me, these words should serve as reminders of the points made in class.

SEVEN PRINCIPLES TO PERFECTING CUTS

Perfecting cuts result from practicing seven principles that are summarized below, in order of importance, and then further explained. It is very important to understand that the first six principles must be followed in order, to achieve success in the seventh principle, Technique, and to perfect cutting on a lathe.

1. GRAIN DIRECTION - SIDE, END, MIXED

Woodturning is challenging because of the many species of wood we use. Wood may vary from very soft all the way to extremely dense and very hard. Grain is the only common denominator. All woods have side grain and end grain.

Knowing the grain direction is critical when woodturning. The grain must either be parallel or at 90° to the lathe bed. Having the wood at any other angle to the lathe bed means that, when the wood rotates toward the cutting edge of the tool, there will be some end grain present, and in woodturning you should always be cutting side grain and avoiding end grain.

Cutting uphill into end grain always creates a catch.

Bowls can have either a side or end grain orientation. A side grain bowl has mixed grain (a combination of both side and end grain) around the outside and inside diameter of the bowl. The base of the bowl will be side grain.

End grain bowls have the same grain orientation as spindle turning, with side grain around the inner and outer diameters of the piece and end grain at the base of the bowl.

Try to avoid cutting into mixed grain directly because doing so can cause catch. Most importantly, never cut with an uphill edge directly into end grain. Focus on making slicing or peeling cuts (a gouge can slice and peel at the same time). Cutting end grain with the cutting edge facing uphill invariably will produce a catch. If the cutting edge of the tool is parallel to the floor or pointing downhill, then scraping, rather than slicing or peeling, is taking place.

There are only three ways to remove wood:

1. Slicing (like a skew). There must be bevel contact (floating rather than rubbing) to create a slicing action.
2. Peeling (like a parting tool, wing of a bowl gouge, or cutting edge of a spindle roughing gouge). Only side grain can be peeled. Trying to peel end grain will cause the tool to self-feed and catch. Note that, when peeling side grain, the bevel does not always have to be in contact but, without contact scraping is taking place and the cutting edge dulls faster.
3. Scraping (many tools). A scraper is not the only tool that scrapes. All tools if used incorrectly can scrape. There are three main ways to inadvertently scrape: (a) the handle is too high, (b) the front of the tool is being pulled with the left hand, (c) the left hand and thumb are being used as a fulcrum during the cut.

A gouge is the only tool that can peel and slice at the same time. The tip of the gouge creates the slicing action, and the wing produces the peel. A bowl gouge shape is better at this combination cut than a spindle gouge because of the differences in cutting surfaces in the respective flutes. A spindle gouge has a radius flute, while most bowl gouges have either a V or elliptically shaped flute. A skew chisel can slice or peel but cannot produce both actions simultaneously.

2. CHUCKING – MOUNTING THE WOOD ON THE LATHE

Wood must be mounted both accurately and securely to prevent vibration during the cutting process. Vibration creates spiral patterns on the surface of the wood as cutting takes place.

It is important to position the wood accurately before securing the piece. Accuracy means positioning the wood correctly so the jaws on a chuck seat and give support before the chuck is tightened. Alternatively for between-center work, the drive centers are position accurately in the center of the piece before the tailstock pressure is applied.

Accurately mounting the piece before securing it will give a much stronger grip and will improve safety.

3. SHARP CUTTING EDGE – TYPE, SIZE, ANGLE

No matter how skilled a woodturner is, no one can produce a good cut with a dull edge. Five factors need to be considered:

1. Type of Tool – Using the wrong type of tool is ineffective and can be dangerous.
2. Size of Tool – For example, blade diameter for a gouge, width of tool for a chisel or scraper.
3. Angle of Cutting Edge – In general, a cutting edge angle of 40° is the most effective for woodturning, but there are many exceptions.
4. Shape of Cutting Edge – For example, wings of a gouge ground straight across for straight cuts and wings ground back for cuts with more shape and detail.
5. Length of Tool – Leverage is an important factor in woodturning. The length of the blade and handle combined determine the tools leverage factor, but leverage is not so critical on small work and a shorter tool may be better suited in this case.

Select the correct type and size of tool for the grain orientation and size or shape of the turning. Example – do NOT use a roughing gouge (sometimes called “spindle roughing gouge”) on a side grain bowl. You will be breaking Principle #1 (Grain) by cutting end grain, which can result in a major catch. Another example – do NOT use a skew for roughing a spindle down, despite what you may have seen in a video. The correct tool is the spindle roughing gouge. Using a skew is slower and increases the potential of a catch.

When selecting a tool, it is important to take into consideration the length of the blade plus handle. The combined length of these give you leverage.

In general, spindle turning rarely requires a long handle or blade because the cutting edge is not usually required to overhang the tool rest very far. Bowl turning requires the use of much longer handles, especially for the inside of the bowl when the overhang can become considerable.

Blade Overhang Ratios

- Cutting – 5:1 ratio (for example, if the cutting edge of a gouge is extended 3” beyond the tool rest, there must be at least 15” of blade and handle length behind the tool rest, and the woodturner must be holding the end of the handle to preclude loss of leverage.
- Scraping – 7 to 1 ratio
- Negative Rake Scraping – 3:1 ratio

Gouge diameter is related to its ability to overhang the toolrest. Too small a gouge or too much overhang causes the blade to flex and vibrate when cutting. Using lighter and/or slower cuts may sometimes mitigate this vibration. Below are guidelines.

Gouge Diameter	Maximum Overhang
1/4”	3/4”
3/8”	1-1/2”
7/16”	2”
1/2”	2-1.2”
5/8”	4-1/2”
3/4”	6-1/2”

Note that gouge diameters might be cited differently in a mail order catalog. The above diameters listed are the physical size of the haft of the gouge, not the English measurement.

The shape and angle of the cutting edge are very important. In many books and videos, woodturners espouse different angles for different gouges or chisels. For the vast majority of all gouges and chisels, the optimal angle is 40°. There are exceptions for tools are used for one-off cuts. An example of this is the bottom bowl gouge used only to cut the last third of the inside of a grain bowl. This tool requires an angle between 50°-70°depending on width and depth of the bowl.

Cutting edge angles of 35° and less will make the tool aggressive and hard to control. Cutting edge angles of 45° and more require greater amounts of pressure when cutting. This tends to lead to over-rubbing the bevel, causing the tool to bounce on the surface.

4. TOOLREST – HEIGHT, DISTANCE, ANGLE

Tool rests are critical for effective control of the tool. Height, distance, and angle of the tool rest must reflect the size or type of tool and size of wood blank and the direction in which the cut or scrape is being made, including consideration of the location at which the cut will start and end.

Height – The standard height for most cuts is approximately 1/8" to 1/4" below center, a little lower for a 5/8" or larger diameter bowl gouge. When hollowing a bowl, you also may need to lower the tool rest as cuts get deeper so as to maintain an upward cutting edge angle.

When planing or rolling beads with a chisel (not needed for gouges), raise the tool rest to above center. The diameter of the wood blank and the size of the chisel will dictate how much the tool rest should be raised.

When scraping (conventional scraping), the tool rest is always set above center so the cutting edge of the scraper is pointing downhill (uphill will result in a catch).

When negative rake scraping, only the negative angle on the top of the blade needs to point downhill, not the actual blade, so setting the rest close to center high will work.

Distance – The distance between the tool rest and the wood is critical for effective tool control. Too much distance, and leverage is reduced. The tool rest must be far enough away that the blade sits on the tool rest and not the bevel. Usually 1/8" to 1/4" from the work is ideal, but if you have a large diameter bowl gouge, you may need to set the rest further back.

Angle – The angle at which the tool rest is set to the wood is critical for both the shape you want and control of the tool. One must be able to both start the cut in a controlled manner and complete the cut comfortably.

5. LATHE SPEED – FAST BUT SAFE

Lathe speed in woodturning is a balancing act. Higher speeds are needed to effectively cut; slower speeds tend to make clean and consistent cuts more difficult to achieve. With higher speeds, there is greater potential for injury, more stress is placed on chucking systems, and unbalanced wood blanks literally can fly off the lathe from excess vibration. To a great extent, variable speed controls on modern lathes has made addressing these issues much easier.

Below are guidelines for round wood blanks that are in balance. For square wood blanks, the longest diagonal measurement should be used. The right column is the key to understanding risk.

Diameter of Wood Blank (inches)	Maximum Lathe Speed (revolution per minute)	Outer Diameter Surface Speed (miles per hour)
2	2,400	14
3	2,200	20
4	2,000	24
6	1,700	30
8	1,500	36
10	1,350	40
12	1,250	45
14	1,100	46
16	950	45

6. STANCE – POSITION OF FEET

Stance is the position of your feet while performing a cut. Stance is an important part of effective and consistent cutting. Positioning your feet correctly is critical to producing desired shapes while controlling the tool during the cutting process. The three stances are:

1. Straight Parallel Cut – Feet are parallel to the lathe bed (may be parallel to the cut if the desired straight cut is slightly angled).
2. Straight-angled Cut – Left foot is forward and points in the exact direction of the angle the straight cut is being made.
3. All Curved Cuts – Concave or convex, both directions. Right foot is forward. Longer cuts may require the right foot to be even more forward. For example, the larger the bowl diameter, the longer the curved cut, so the right foot will need to be quite far forward to maintain balance during the entire cut.

7. TECHNIQUE (PUSH CUT STYLE)
Technique is the way the tool is controlled, both with the type of cut and with using your hands correctly. Technique is the last principle on the list, but technique must be considered before selecting a tool, setting the tool rest, and determining stance.

Push Cut – The principal style of cut I use and teach is the "push cut," a name I assigned to my style after watching other professional woodturners pull the gouge around the outside of a side grain bowl. I call their style the "pull cut." Note that a pull cut cannot be performed on the inside of a bowl and that it is not possible to get into corners using the pull cut. The push cut should be learned and practiced first to foster use of the most effective woodturning cuts.

Using Your Hands Correctly – For the purposes of this explanation, assume the woodturner is right-handed and therefore push cuts are controlled by the right hand (the hand that holds the handle).

The key mantra associated with use of the push cut is that control comes from the right hand only. It is not possible to complete a perfect push cut using both hands as controlling elements, but the pull cut, negative rake scraping, and conventional scraping require control from both hands.

What does this right hand and arm do to control the tool during a push cut? Only four motions and their opposites are possible:

Right-Hand Control
- Push or pull the tool, creating the tool travel. There are no cuts without this action.
- Lift or drop handle – This controls cutting edge height and angle.
- Twist – rotating the handle with the wrist.
- Swing – There is no swing for straight cuts, but all curved cuts require this action.

Straight cuts use the first three motions (lift, push, twist). If swing is added to these three motions, then the cut will no longer be straight and a curve will be created. Therefore, curved cuts require all four actions simultaneously – push, lift, twist, swing. Straight cuts require a combination of two motions, either push and lift or push and twist. Note that nearly all straight cuts involve body contact with the handle for the entire motion of the cut.

All curved cuts do not involve handle contact with the body. The cut may start with the handle against the body, but as soon as the tool moves, the contact will cease because there is simply too much travel in the handle during curved cuts. If the cut is progressing in the opposite direction, then the handle would start away from the body and, at the very end of the cut, the handle would either be touching the body or be very close.

What does the left hand do? Think of the left hand as an assistant who adds no controlling action to the tool but performs actions that cannot be done by the right hand (the hand holding the handle). The left hand provides assistance in four ways, but only one (weight) is essential in all cuts.

Left-Hand Assistance
- Weighting the front of the tool – Adding weight to the front of the tool or down onto the tool rest is essential in all cuts. Most tools are not heavy enough at the front, largely because the handle is lower than the blade. But if you do not add some weight (appx. 1-2 pounds) to pull the front of the tool down on to the tool rest, the tool becomes unstable during a cut and will tend to bounce on the rest.
- Positioning the front of the tool for the start of the cut – The right hand is simply too far back to effectively position the front of the tool accurately at the start of the cut. The left hand, at the front near the cutting edge, is much more capable of accurately positioning the tool at the very start of the cut. But it is worth noting that you will usually need to move the left hand back away from the tool rest once the cut has started and the bevel is in contact with the wood. Most new woodturners leave their left hand too close to the tool rest after the cut has started, and this will inhibit the tool's smooth travel.
- Preventing skid – When starting certain cuts, such as an entry cut on the inside of a bowl or cove, the gouge will want to skid or skate on the surface rather than penetrate the surface. This is because, at the start of the cut, there is no bevel contact. But on soft entry cuts like beads, the bevel engages first, so the tool will not skid. This skidding effect will not take place on a broken surface such as a natural-edge bowl or pommel … the tool will simply not skid on air. The left hand can prevent this skid or skate by using the left thumb on the tool rest (in contact with the rest) behind the gouge blade, with the left-hand fingers on the opposite side of the blade pinching the blade between thumb and fingers. A key point is that this assistance from the left hand must be only momentary. Once the cut has started and the bevel has wood behind it, the left hand must be moved back away from the rest and used only to add weight. Leaving the left hand on the tool rest often prevents the tool from cutting correctly.
- Braking at the end of the cut – At the end of certain cuts, the tool must be prevented from travelling past a certain point – for example, past the center on the inside of a bowl or box. The left hand is used to squeeze the front of the tool back toward the right hand to counter the pressure

being applied to produce the cut, in essence applying a brake. This squeezing technique also is useful while cutting the outside of a side-grain bowl – to reduce the bounce effect typically caused by the left hand adding pressure to the bevel, in effect helping to float the bevel. The left hand must never control the tool or influence the path of the tool. The left hand will destroy any cut if it influences the path, adds pressure to the bevel, or removes the bevel off the surface by pulling the blade. The left hand or thumb must not become fulcrum points. The left hand must not pull the front of the blade at any time, because doing so causes the bevel to come off the wood and the cut to become a scrape, leaving small grooves in the surface of the wood. Scraping also will dull the cutting edge approximately 30 times faster than keeping the bevel in contact with the surface.

OTHER ASPECTS OF TOOL CONTROL

Understanding Handle Height – Handles need to be at the correct height for each type of cut. If too high, the cut turns into a scrape. For some cuts, if the handle is too low, the tool may become aggressive. Knowing the correct handle height is learned through experience.

Understanding the Concept of Bevel Flotation – The bevel must be in contact to cut (if not, you are scraping), but the amount of contact is the critical issue. The bevel must float (i.e., move across the surface without pressure on it) rather than rub on the surface.

The phrase "rub the bevel" is incorrect. Rubbing the bevel meaning creating pressure on the bevel, and this will make the tool bounce on the wood surface. The correct phrase is "float the bevel," meaning the bevel is in contact with the wood but has no pressure applied to it. All the pressure is used to move the tool forward into the wood being cut away.

When pressure is applied to the bevel, the bounce occurs most often in bowl turning because the grain is mixed (both side and end grain) and there are different densities in the grain. It can be produced in any wood in any cut but tends to be less of a problem on short or spindle cuts. Any pressure on the bevel will start a very small almost unnoticeably bounce on the surface at first, but, as the cut progresses, the bounce will amplify and the longer cut the more the bounce will grow … and result in an uneven or rippled surface.

A vivid demonstration of the destructiveness associated with bevel rubbing is attempting to cut a broken surface while pushing the bevel on to the wood, such as cutting a bark-edged bowl or a pommel (the shoulder between the square section and the rounded diameter on a chair leg or baluster). Unlike rubbing the bevel on a solid surface, the effect of placing pressure on the bevel while cutting a broken surface is instantaneous failure of the cut.

Understanding Flute Orientation (applies to gouges only) – Flutes must be correctly oriented. Too open and the cut will become aggressive. Too closed and the tool will fail to cut.

An open flute means that the opening of the gouge faces the ceiling. A closed flute means that the opening of the gouge faces the floor. Because no cuts are possible with the flute fully closed, to achieve a cut the flute must be facing right or left, or more open.

During any curved cut, the flute must be twisted or rotated to enable the cutting edge to reorient to the grain. Concave cuts start with the flute on its side (left or right) and end with the flute fully open (facing the ceiling). Convex cuts start with the flute fully open (facing the ceiling) and end with the flute half closed (left or right).