

For turners who have never tried segmented turning or for those who would like a refresher on the basic concepts, here is a simple, easy approach to turning a segmented bowl. This quick, accurate method will acquaint you with the fundamentals of segmenting, which you can then apply to more complex pieces. The bowl presented here makes use of a solid layer of wood for the foot and four progressively larger rings, each one comprising multiple segments cut at predetermined angles.

Segment-cutting sled

As you would imagine, segmented projects require careful attention to creating a blank prior to turning. The table saw is my preferred tool for cutting segments, and a sled with a fence set at the correct angle is the best way to produce identical segments. Some time invested up front creating a good sled will help you far into the future. I recommend making and using a Wedgie Sled, a simple fixture designed by renowned segmented turner Jerry Bennett. Plans and instructions for building this sled, as well as helpful videos, can be found at Jerry's website, segeasy.com. Regardless of the sled design you choose, the goal is to be able to cut desired angles accurately and with repeatability.

JOURNAL ARCHIVE CONNECTION

Jim Rodgers has written previously in *American Woodturner* on segmenting. His 2005 article on cutting accurate segments (vol 20, no 4, page 24) offers helpful information, including an alternate sled design and tips on gluing segments into rings. AAW members can access all past journal articles online at woodturner.org.



Turning Your First SEGMENTED BOWL

Jim Rodgers



Selecting wood

You will need to determine which wood species to use; I had some very dry Eucalyptus cut a few years ago from a friend's yard. Mill the wood to the desired thickness you want for each level, or ring. I chose $\frac{5}{8}$ " (16mm) thickness. It is important that you select wood that is thoroughly dry, with moisture content of six to twelve percent. Using green, or unseasoned, wood introduces a greater likelihood of wood movement, which will cause glue joints to fail.

Plan your bowl

Unlike other kinds of woodturning, segmented projects require detailed planning of the piece you wish to create. For this project, I decided on a small popcorn bowl that would fit in your lap—about 3" (8cm) tall by 7" (18cm) diameter.

Make a drawing

Make a full-sized drawing of your bowl on graph paper with your desired profile. This drawing will help you determine the ring diameters and thicknesses as well as the segment sizes required. Allowing for extra wall thickness now will help you minimize any problems you might have later in aligning the rings or turning the bowl. Next add horizontal lines to indicate the foot and ring thicknesses, based on the thickness of the wood you will be using. Add a centerline to the drawing and number each level, or ring, of the bowl from the base upward (*Figure 1*).

Note that drawings made with sophisticated software or using trigonometry functions will render more accurate results, as a simple two-dimensional drawing cannot account for the three-dimensional aspect of the bowl's curvature. This is why allowing for extra wall thickness

Plan your segmented bowl

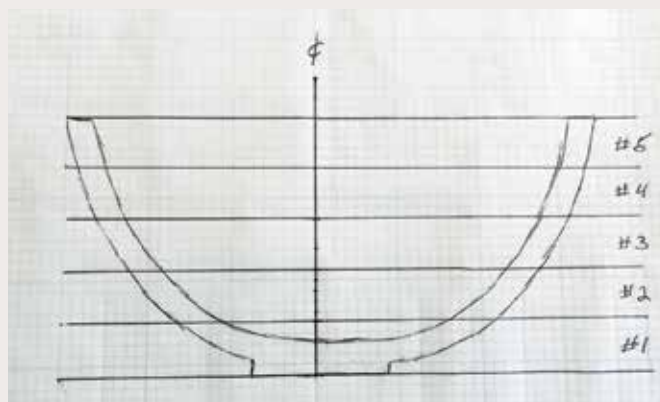


Figure 1. Start with a full-sized drawing of your desired profile, then indicate the thickness of each segment layer, or ring, with horizontal lines.

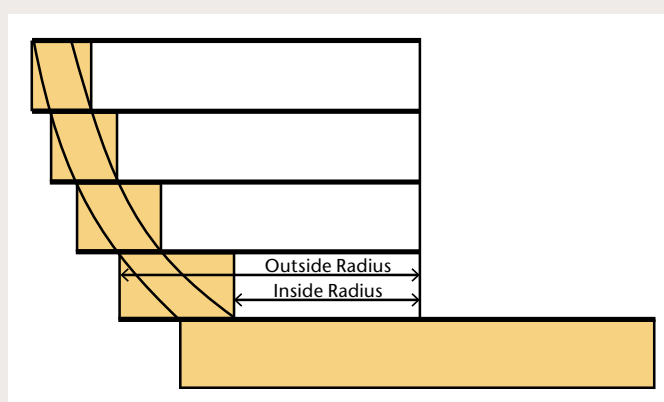


Figure 2. Measure the required width of each segment by subtracting the shortest inside radius from the longest outside radius. Note that the foot layer is a solid circle of wood, not a segmented ring.

is especially important when using a two-dimensional drawing.

Determine board length

Planning your bowl requires a few simple calculations based on your initial drawing. As you make the calculations, record the results in a table for easy reference. First, you will need to determine the board length needed to cut the right number of segments for each ring. The board length is equal to the circumference of each ring (plus about 4", or 10cm, for safe holding during cutting). To find the circumference of each ring, measure its diameter (d) on your full-sized drawing and multiply that number by 3.14 (Pi, or π)—since the circumference of any circle = $\pi \times d$.

Determine segment length

In order to cross-cut the individual segments on your sled, you will need to determine the length of each segment's longest, or outside edge. This is found by dividing the ring's circumference by the number of segments in that ring. In my example project, each ring is made up of twelve segments, so I divided each

ring's circumference by twelve to get the length of each segment's long, or outermost edge.

Determine segment width

You will also need to know the width of the wood strips that will make up each segment. To make this determination, go back to your drawing and measure both the longest outside and shortest inside radii of each ring, using the centerline as the point from which to measure. Subtract the inside measurement from the outside measurement and record

the resulting number as the width of each strip (Figure 2).

Cut your stock

With all of the critical calculations made and recorded, you will have a cut list you can use to begin preparing the wood, first by ripping the timber to the needed width, then by cross-cutting the strips to overall length. Label the strips as you rip them so you can easily see which rings they are to be used for.

Set up the table saw to cut the individual segments to the correct length ▶

Cut the segments



1 Use a 30/60/90 triangle to set the fences on your table saw sled to the desired angle.



2 Cut the individual segments. The length of all segments is made identical with the use of an adjustable stop (bottom right of photo).

Glue the segments



3
Glue the segments into rings, using a band clamp to apply even pressure.

True it to glue it

Use a waste block attached to a faceplate as the base on which to assemble your segment rings. A straightedge held across the face will help you determine its flatness, which is critical to a good glue joint (*Photo a*).



A flat board with 80-grit abrasive resting on the toolrest for support works well for flattening each ring prior to gluing on the next ring. Keep the lathe speed low, about 600 rpm, during this process (*Photo b*).



and at the correct angle. My setup includes a zero-clearance throat plate, a good quality finish-cut saw blade, and a stop for cutting multiple segments at the same length. You also need to set your table saw sled to cut the segments at the desired angle. The included angle is determined by dividing 360° (a full circle) by the number of segments. So, for example, any twelve-segment ring, regardless of its circumference, will require 30° angles on each individual segment.

Cutting segments using the Wedgie Sled is a little different from cutting on an average table saw sled: the Wedgie can be adjusted to cut different angles

by pivoting its two fences. The angle between those fences is set to the necessary included angle for the segments; the first half of a segment is cut using one fence and the second half, using the other fence. When you cut the segments, there is no flipping the strip, as you would have to do with single-fence sleds. To realign the segments with the greatest precision during glue-up, mark the top face of each wood strip with a continuous line prior to cutting and also mark one edge. An easy way to set the fences for a 30° cut is to use a commonly available 30/60/90 triangle. Place the triangle on the sled with the 30° angle

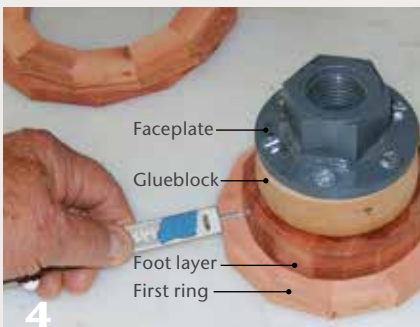
between the two fences. Move the fences until they touch the edges of the triangle, then tighten down the fences (*Photo 1*).

Cut all the segments for each ring, keeping the top surface of each strip (marked with a pencil line) facing up (*Photo 2*). I find it helpful to organize the rings in labeled plastic bags to avoid confusion over which segments are for which rings. Carefully sand each segment to clean up any frayed edges, being careful not to round over corners or touch the face of the cut edge.

Glue segments into rings

Dry-fit the segments of each ring together, keeping the top surface pencil

Simple centering methods



Three methods of centering a ring when gluing it to the previous layer. Use a ruler or your fingers as a gauge, or mount the ring in large chuck jaws mounted on your tailstock.

lines facing up and the edge lines alternating, with one facing inward, the next outward, etc. A rubber band will hold the segments together while you check the quality of the glue joints; shine a light from behind the ring—no light shining through indicates good joints. When you are satisfied with the fit, apply glue to the edges and use a band clamp to apply pressure (*Photo 3*). Do this for each ring.

If gaps appear during your dry fit, it is possible you have allowed the strips to slip while cross-cutting the segments, or frayed edges or stray sawdust may remain. It may be necessary to clean up the edges further or recut the segments for that ring more carefully.

Make a bowl blank

When all of your segment rings are glued up, the next step is to glue them together to make a bowl blank, starting with the solid foot layer on the bottom, then adding the rings from smallest to largest as you go toward the rim of the bowl. I recommend assembling your bowl blank on a glueblock attached to a faceplate. Flatten the glueblock, verifying its flatness with a straightedge before adding the bowl's foot. Glue on the solid layer that will become the foot. Now build your bowl blank one ring at a time.

As you glue on each successive ring, rotate it by half a segment's width to alternate the vertical glue lines and create a "brick-laid" pattern for strength. You may want to mark the center of one segment with a pencil line to ensure the next ring aligns at the halfway mark accurately.

Flatten one side of each ring on a sanding disc or flat sheet of 80-grit abrasive. After flattening the foot, glue the smallest ring onto it, taking care to center the ring the best you can. Centering each ring can be done in several ways. If you do it off the lathe with a ruler or by gauging centeredness with your thumbs

(*Photos 4, 5*), be sure to true the ring's diameter on the lathe before adding the next ring to minimize "creeping errors" of subsequent rings. On-the-lathe methods can provide more centering accuracy. If you own a tailstock live center system that has headstock threads, you can mount a scroll chuck with large jaws on your tailstock (*Photo 6*). This will center the rings very accurately for gluing, and you can use the tailstock crank to apply gluing pressure.

After the glue is dry on your first ring, true up the exposed face before adding the next. An easy way to do this is to sand the surface on the lathe using a flat board with abrasive glued to it (*See Sidebar*). Continue this process until all of your segmented rings are glued on and you have a rough segmented bowl blank (*Photo 7*).

Turn your bowl

Shape the exterior of your bowl first by following the drawing and ignoring the "steps" between the rings. If you follow the shape, the steps will disappear as the shape is achieved. Keep the base oversized for extra support until the last steps (*Photo 8*). Next, work the interior from the rim downward one or two rings at a time. After completing the interior, reduce the base to proper dimension and cut a clearance groove at the bottom of the defined foot to allow access for sanding the bowl's foot (*Photo 9*).

I prefer to sand and finish both the interior and exterior while the bowl is still mounted on the lathe for ease of handling. When you are satisfied with your finish, part off or cut the bowl from the glueblock. Sand and finish the bottom of the foot by hand. ■

Jim Rodgers is president of the Segmented Woodturners, a virtual AAW chapter (segmentedwoodturners.org). He also offers information on the basics of segmented turning at his own website, jlrogers.com, and can be reached at jlrogers@aol.com.

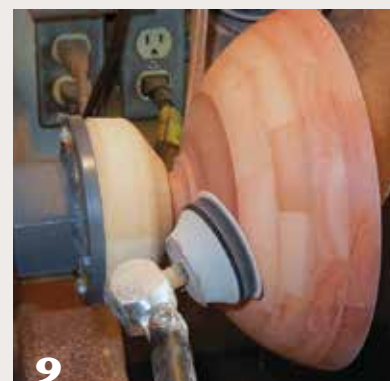
Turn and finish



7 A completed bowl blank built from four segment rings and a solid layer for the bowl's foot.



8 The outside profile turned. Leave the foot material thick for added stability during turning near the rim.



9 Sand your segmented bowl, apply finish, and part or cut it off the lathe.