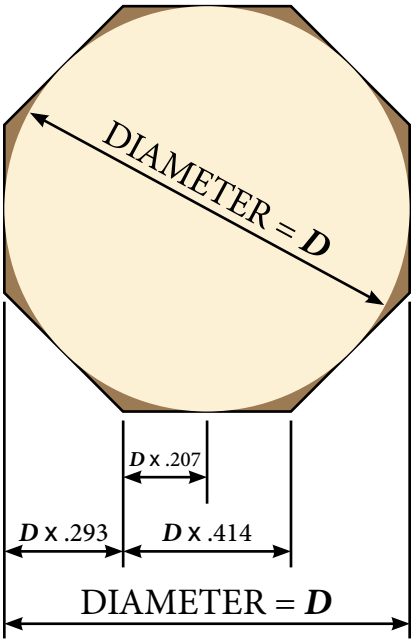
NOW SPHERE THIS!

by Matthew Kilareski

Spalted maple sphere with carnauba wax finish, four inches in diameter

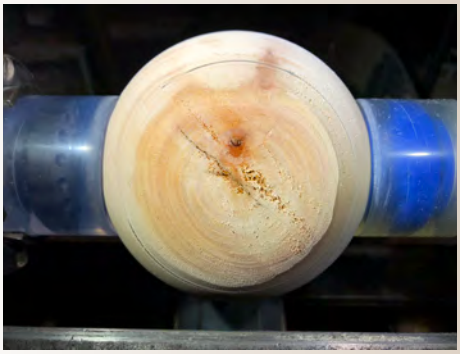
Inspired by Alan Stratton of As Wood Turns, I began turning spheres in early 2019. In his video, "Woodturning Essentials – Octagon Method for Perfect Spheres" (https://tinyurl.com/r3gpwof), Stratton explains and illustrates how to create spheres. He does so by projecting the corner points of an imaginary octagon that is circumscribed around the largest possible sphere that could be turned out of a given cylinder. As the corners of the rotated octagon are rounded off, the sphere takes shape.



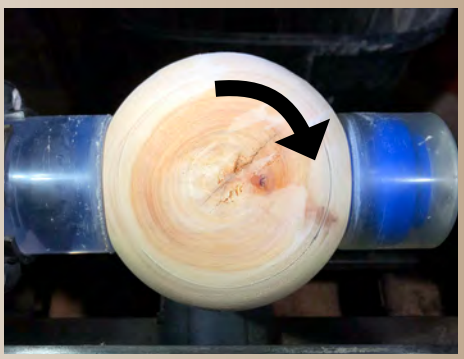
To refine this shape, the rough form is rotated between centers through the X, Y, and Z axes and the excess material is shaved away. The material to remove is seen through the persistence of vision effect, where the transparent "ghost image" shows the extra material and the sphere is viewed as an opaque shape.

In order to ensure that the sphere is turned true along each axis, a unique landmark is selected that has a recognizable orientation: something like an oval ring in the grain, an angled knot, a line of spalting, etc. With the sphere mounted between cup centers and the landmark facing forward, in the "twelve o'clock" position, the sphere will rotate on the lathe in the X axis. By keeping the landmark facing forward but turning it 90 degrees (to "three o'clock") the rotational axis is now the Y axis. Reorienting the sphere so that the landmark is centered in one of the cup centers establishes the Z axis. Moving through each axis sequentially while truing up the sphere and sanding, helps to evenly shape the form. It is important to never skip an axis while cycling through the process of cutting or sanding, or the sphere may become lopsided.

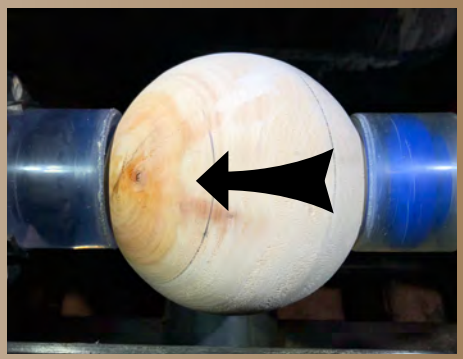
LANDMARK ORIENTATION SEQUENCE



Twelve O'Clock Position



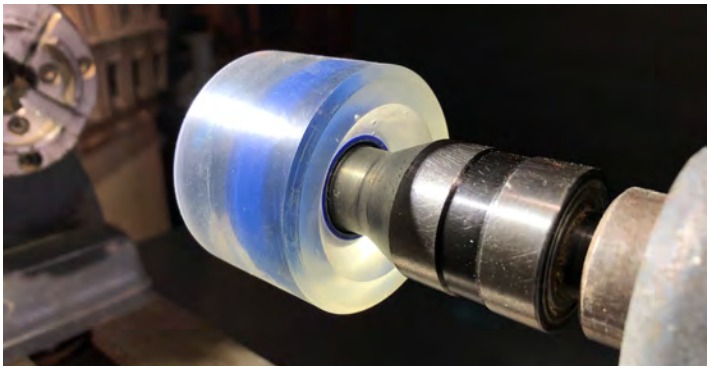
Three O'Clock Position



Cup Center Position

SPECIAL MATERIALS & TOOLS

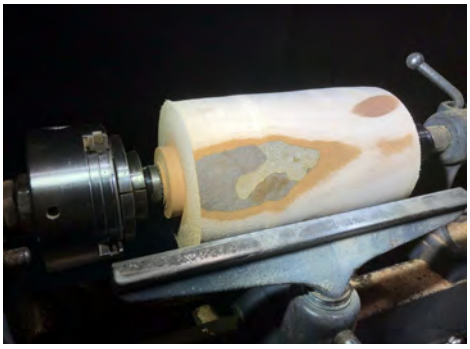
- **Wood:** Any species, the stock to turn should be able to produce a cylinder with a diameter that is smaller than the length of the stock. There should be enough length to hold the wood between centers and/or with a tenon in a chuck and revolving tail center.
- **Turning Tools:** I use carbide cutting tools, but traditional skews and gouges would work fine.
- **Cup Centers:** These are used to hold the sphere while turning once it is cut away from the main piece of stock. You can make these by hollowing the ends out of the extra stock and using rubber washers to keep from marring the sphere. Instead of using wooden cup centers, I prefer to use skateboard wheels. Made of urethane, clear longboard style wheels have a concave design that grips the sphere without marring the wood. Just make sure you get wheels with a durometer hardness of 80A or higher, like these: https://tinyurl.com/sxy5b5s. Softer wheels will flex too much under the pressure of the tailstock.
- **Sandpaper:** I like to use power sanding discs, but loose sandpaper works as well. Generally, I sand from 80 to 600 grit, and then use abrasive sanding paste.
- **Finish:** Oil, wax, and friction polish finishes work well and can be applied on the lathe.



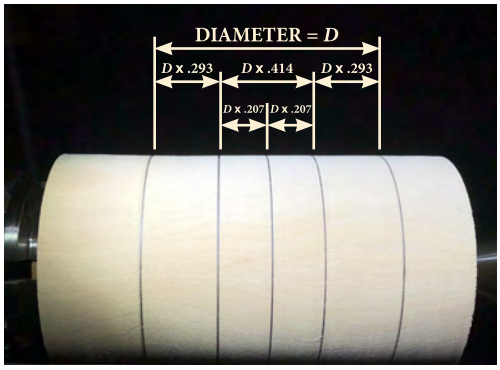
Revolving center with skateboard wheel, bored out and friction fit.

PROCEDURE: TURNING THE SPHERE

Step 1: Turn the Cylinder – Mount the wood between centers and true up the piece to a uniform cylinder with a diameter less than the length of the stock. Cut a tenon on one end and remount the wood in the chuck with tail stock supporting the opposite end.

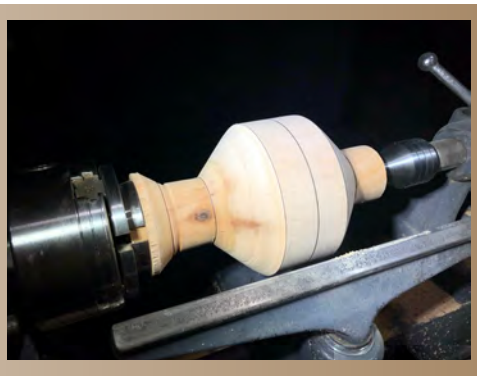


Step 2: Mark the Octagon Corners – The formulas for marking the projected corners of the circumscribed octagon are all based on the diameter of the sphere. Measure the diameter and draw the centerline of what will become the sphere. Mark another line on either side of the center at a distance equal to the diameter times .207, half the length of each side of the octagon. Next mark the projected diagonal outside corners, .293 times the diameter from each of last marks. The distance from each of these outside marks should be equal to the diameter of the cylinder. Note: each octagon side will be .414 times the diameter and this dimension will be used later.



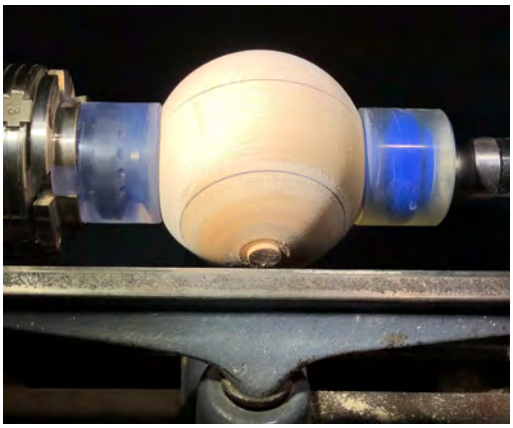
- **Side = *D* x .414**
- **Half Side = *D* x .207**
- **Projected Diagonal = *D* x .293**

Step 3: Shape the Octagon – Once the corners of the octagon have been projected onto the cylinder, reduce the ends of the stock to a size equal to the calculated octagon side dimension (Diameter times .414). Cut the diagonal sides, by connecting the corners of the front side with the newly created sides. The length of the diagonal sides should be equal to the length of the front sides.

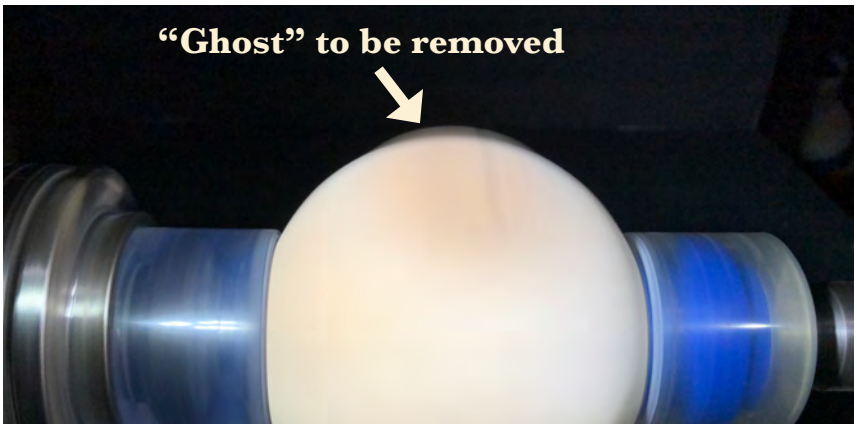


Step 4: Mark the Diagonal Centers, Trim Corners, and Cut Free – Mark the halfway point on the diagonal sides. Along with the centerline, these midpoints correspond with the points where the sphere contacts the sides of the octagon. Shave away gentle curves from both sides of the center line to the diagonal midpoint lines. Also cut the curves from the diagonal midpoints to the center of the axis of rotation, trimming down the outer stock to a thickness that gives enough support between centers. Once all the curves have been roughed in, the sphere can be parted from the ends of the stock.

Step 5: Cup Mount and Remove the Nubs – Remount the sphere between wood or urethane cup centers, at 90 degrees to its original axis of rotation. Trim away the remaining nubs from of the stock and smooth out the curves toward diagonal midlines.



Step 6: Select a Landmark and Cut Away the Ghosts – Chose a landmark on the surface of the sphere that will let you establish the X, Y, and Z rotational axes. With a starting orientation selected, cut away the transparent "ghosts" with light cuts, leaving only the opaque circular form. Repeat this procedure with the other two axes, making sure to keep track of the sequence that you cycle through. After two or three cycles the sphere form should be ready for sanding.



Step 7: Sand and Finish – Continuing the process of cycling through the different rotational axes, sand the sphere through each grit to your desired finish level. Because I tend to leave tool marks from the initial cutting, I start by power sanding with a two-inch 80 grit sanding pad. It is important not to sand too close to the cup centers, or raised circles can be left by the centers. After the sanding is complete you can easily finish the sphere on the lathe with oil, wax, or friction polish. This will also be done by using your landmark and cycling through each axis in sequence.

Step 8: Displaying the Sphere – How you choose to display your sphere is up to you. One of the simplest ways to create a stand is turn a small circular depression in one of the excess pieces of wood from the original sphere turning. Then shape the rest of the piece into a stable base.