

# Turning A Hollow Sphere



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**Photo 1** Sphere with separate stand



**Photo 2** Spheres with finials top and bottom



**Photo 3** Sphere with a stand

Would you like to add a little extra artistic flair to your wood turnings? Have you been thinking about ways to spice up your work? Want to add that WOW factor to your turnings? Do you want that “How did you do that” response from others? I have just the Project for you. This is a Project that looks complicated but is quite simple. You will be limited only by your imagination. This article is a tremendous thought starter. Even though these are delicate I use tools and techniques that really simplify the process. You can be turning pieces like this in no time.

This article will attempt to show the process for turning hollow spheres. The first thing to do is to determine what you want your sphere to look like. This is the planning phase. There are several ways to incorporate the hollow sphere in your design. I will describe a few of these. The sphere can be left as is without any additional enhancements.

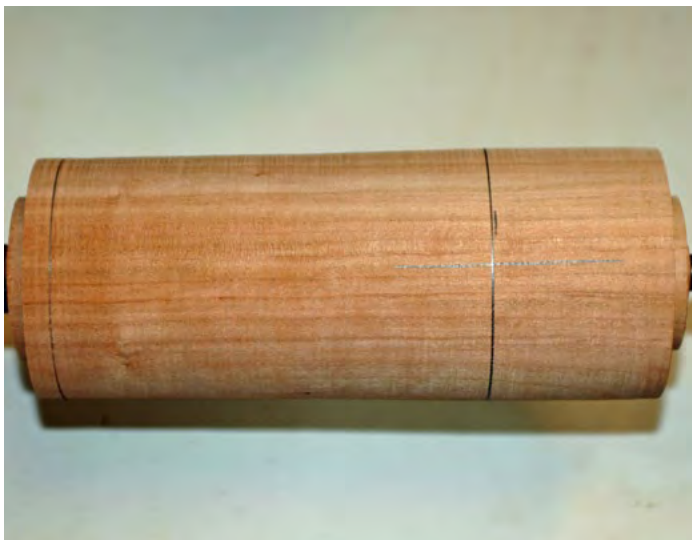
I prefer to use the surface of the sphere to complete additional enhancements. First is a sphere by itself, with a stand to hold it, See **Photo 1**. This is the way I started out making hollow spheres. These hollow spheres are really unique to touch and hold. They amaze me as they are lighter than they appear, due to being hollow. I have a lot of fun making these. But I ran into problems when people started looking at them. They would pick up the piece and then turn it over to see what was on the bottom. All of a sudden the sphere would drop out of the stand and go rolling across the floor. I moved to another style to eliminate this problem.

Next there is a hollow sphere with two finials, such as an ornament, See **Photo 2**. Here the finials are one piece with the sphere, not glued on afterward. This is the way I make all of my ornaments, as it is different from the norm. Also I do enhancements to the sphere after it is hollowed, primarily piercing. This opens up a lot of possibilities, such as painting, wood burning, carving and anything else you can think of.

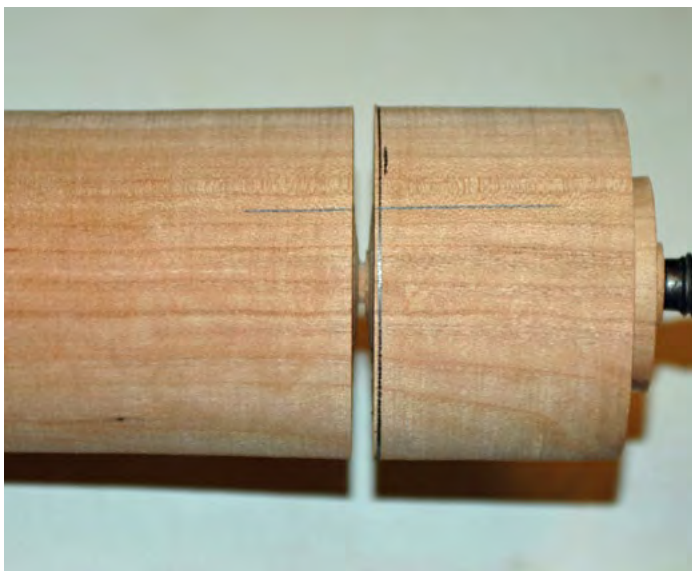
The third type of which I will be discussing in this article is an elevated hollow sphere, See **Photo 3**. The sphere has its own built in stand and is all one piece. This way the sphere can't fall out of the stand. Again the sphere and stand is all one piece, not a sphere glued to a stand. This opens up a lot of design pos-



**Photo 4** Rough your wood to a cylinder



**Photo 5** Mark the center of sphere, 1/2 of diameter



**Photo 6** Cut top half of sphere from the bottom

sibilities, as mentioned earlier you are limited only by your imagination. This will be the type of hollow sphere we will be working with today. The techniques and tools used for this style are the same for the other styles. Now that we have decided on a style lets get started on the process.

I use face shields and safety glasses when turning. I also have a dust air filter and a vacuum running as needed. I wear a dust mask as needed and I have a sealed face mask to use if the wood dust is toxic, such as Cocobolo.

We need a piece of dry wood to start with. Our design will be about 8" tall and have a 4" diameter sphere. We will be using cherry for this example. I like cherry if it will be pierced later. It is very difficult to pierce dark woods. The wood will be turned between centers to start. Finish cut the piece of cherry to a 4" diameter. Next cut a 1/4" tenon on each end of the cherry cylinder, See **Photo 4**. Remember to shape the tenon to your chuck and jaw size. I use a Oneway Talon chuck with #2 profiled jaws, but any will work.

Since we have planned for a 4" diameter sphere we need to mark the cylinder 2" down from the shoulder of the tenon on the tail stock end. We are going to cut the top half of the sphere from the bottom. Before we do we need to mark a horizontal line on the cylinder going across the point where we will cut the cylinder in two pieces, See **Photo 5**. This mark will help us to line the grain up when we glue the two halves back together. We will cut the top apart with a parting tool. Be sure to cut on the left side of the pencil line. Cut in to the wood until there is about 1/4" of wood left in the center, See **Photo 6**. Take the cylinder off the lathe. You should be able to twist the two pieces apart. Don't worry about tearing wood fibers as the centers will be hollowed out.

Now we will hollow the top and the bottom halves. Remove the spur drive from the head stock and install the chuck. It really does not matter which half you start with, but I always start with the top. Place the top half of the piece of cherry into the chuck. Make sure it is secure and turn the lathe on to assure the piece is turning true, or balanced. If not adjust it, there will not be a lot of room left to true it up later.



**Photo 7** Measure outside diameter, inside 6mm less

Turn the lathe off and adjust the tool rest to hollow the inside of the top half of the sphere.

At this point we will measure the outside diameter of the cherry, in millimeters, See **Photo 7**, it measures 99.9mm so lets call it 100mm. I like whole numbers like 3mm in stead of 1/8". What ever the outside measures we are going to make the inside diameter 6mm less, here it will be 94mm. This will give us a 3mm wall thickness, perfect for piercing later. Now when the two halves are glued back together the inside needs to be a perfect sphere. When cutting the outside later you will not be able to measure the wall thickness. To help with this I have had a custom set of plastic laser cut disks made as templates. These could also be made out of card stock, See **Photo 8**. These range from 40mm to 118mm by 2mm steps. I have a second set from 125mm to 200mm by 5mm. My disks have two sizes on each to save material. For example the one we are using here is 94mm which is on one half of the disk. The other half is 92mm.



Also there is a gap of 2mm between the two center lines. This is used to make a 2mm lap or step joint for the glue seam. The center of the spheres are the two outside lines. The center line is used for the second half of the sphere so we can hollow it 2mm deeper to allow for the step joint. The step joint is stronger than a butt joint.

**Photo 8** Sphere cutting guides, paper and plastic

Now that we know the inside diameter its time to hollow the top half. Verify our math is right and hold the 94mm disk against the cylinder to assure there will be a 3mm wall, See **Photo 9**. Hollow the inside with a bowl gouge. After most of the wood is removed start checking the size with the plastic guide. The guide needs to fit perfectly in the sphere up to the first line on the guide, See **Photo 10**. When it does there will be a perfect half sphere.



**Photo 9** Visually check you have the right guide

At this point we need to cut a step for the step joint. There should be a 3mm wall thickness at the joint line. With a parting or Bedan tool cut a 2mm deep step on the inside of the wall of the sphere. Just split the wall in half, say 1.5 mm wide step. You need to measure to assure it is exactly 2mm deep, See **Photo 11**. If it is deeper the two surfaces will have a gap on the inside when gluing. If it is less there will be a gap at the glue line on the outside, which we definitely



**Photo 10** Cut the inside to the first line on guide



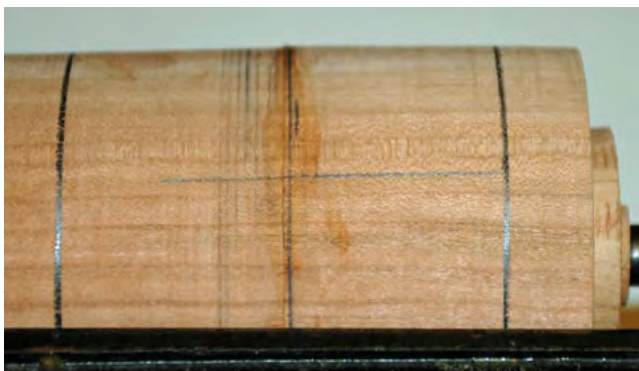
**Photo 11** Cut a 2mm step on the inside of the top



**Photo 12** Cut bottom 2mm deeper than the top



**Photo 13** Cut a 2mm stem on the outside of bottom



**Photo 14** Glue top to bottom and mark inside sphere

don't want. Either way it reduces the strength of the joint. To date I have never had one of my spheres separate at the joint, knock on wood. Take the top half off the chuck. Keep it handy as we will need to make the step joint on the bottom half fit the top.

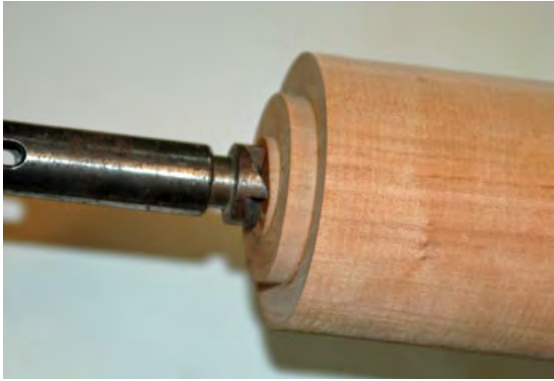
Put the bottom half of the cherry into the chuck. Assure the piece is running true. The bottom half is longer and extends farther off the chuck and may take a bit more effort to align. Hollow the bottom as you did in the top half. Be careful as the bottom half is farther off the chuck than the top half. A catch can pull the wood cylinder out of the chuck easier. Again measuring with the plastic or card stock guide. This time we have to fit the guide 2mm deeper into the cherry, See **Photo 12**. This is the reason for the center lines on the guides being 2mm apart. On the bottom half the guide needs to fit to the second, or center line, which is 2mm away from the first. Are you starting to see the picture? The step joint on the top half is 2mm deep. The bottom half is cut 2mm deeper than the top half. This is so the bottom half can fit 2mm into the top.

Now that the bottom is hollowed to fit the guide, 2mm deeper than the top, we need to put a step joint on the bottom half. This time it goes on the outside of the wall. Remember it is only 2mm deep, See **Photo 13**. We want a tight joint so take a small amount of wood off at a time. Check to see if the top half will go on. If not take a little more off and try the top again. Continue this until the top fits on the bottom snugly. Take the top off and add glue to the top half joint, See **Photo 14**. I only put glue on one half and have never had one come loose. Don't over do it as we don't want excess glue on the inside of the sphere. About the glue, I use two types. If the joint will be seen I prefer to use white Elmer's glue as it dries clear. If the joint will not be seen after some enhancements you can use Titebond II. Now fit the top back on the bottom. Notice how the horizontal line aids grain alignment. I use the lathe to clamp the two halves together, See **Photo 14**. Pull the tail stock up and secure it against the top. With the joint so thin it will dry in a few minutes. You can continue working after 15 minutes, as you will be working with the cylinder between centers again.

Now we need to find the bottom of the hollow sphere



**Photo 15** Rough the stem down to size



**Photo 16** Use a taper extension



**Photo 17** Rough the corners with a gouge



**Photo 18** Home made sphere cutter

inside of the cylinder. Place a mark half of the diameter, 50mm in this case, on either side of the glue line, Remember the inside hollow sphere should be 3mm up from this mark. Draw the marks all the way around the cylinder. We will be taking the wood below the bottom mark down to about 1", or whatever diameter you need to produce a stem of your desired design. Also mark a line on the bottom of the cylinder 1/2" from the bottom shoulder, next to the head stock. This will be the bottom of the stand portion.

Use a Bedan or parting tool to cut down toward the center next to each line, approximately 1", See **Photo 15**. Leave the pencil marks showing. Now rough the stem down to 1". We will finish the stem later.

Remove the cylinder from the chuck. Remove the chuck from the lathe. Place a tapered extender in the head stock. Place the live center in the extender, See **Photo 16**. The reason for this is to have clearance between the head stock and the sphere cutter when cutting the outside of the sphere. This is only important if doing a sphere without a stand or finials. You can leave the piece in the chuck if there is a stand or finials. Place the cylinder back between centers, the top toward the tail stock. Fit the bottom in the same impressions left by the spur drive earlier as this will keep the piece in balance.

Rough a bit of the corners off on the sphere section, making it look a bit more like a sphere, See **Photo 17**.

We are going to complete the sphere with a sphere cutting tool. The one I have was made in a machine



**Photo 19** Square cutter to the bed of the lathe

shop for my lathe, See **Photo 18**. Lindsay Lathe Tools also sells one to fit any size lathe. My sphere tool pivots on two bearings and will be aligned under the



**Photo 20** Center cutter to the glue line of the sphere



**Photo 21** Slide cutter outward until it clears all wood



**Photo 22** Adjust cutter to take a small bite per pass



**Photo 23** Continue until the glue line cleans up



**Photo 25** Sand off the nubs

glue line. I use a jig block which fits between the ways of the bed to square the sphere cutter to the bed of the lathe, See **Photo 19**. The cutter needs to be aligned to the center line of the lathe, here it is 8". Slide the cutter tool toward the glue line and center the sphere cutter to the glue line, See **Photo 20**. The cutter arm has a 3/16" tool steel cutter in the end of it. Now slide the cutter out enough to just clear both sides of the sphere. Lock down the cutter arm. Turn the lathe on and swing the arm back and forth assuring there are no high spots, See **Photo 21**. Pull the arm back to the glue line. Loosen it up and slide it 1/32" closer to the glue line. Swing the arm back and forth removing wood from the sphere area, See **Photo 22**. Now you will notice why the tapered extension is used. It gives clearance between the arm and head stock. Continue until you just clean up the glue line, See **Photo 23**. At this point we have a hollow sphere with a 3mm wall, although any thickness wall can be achieved, for example thicker for carving. Slide the cutter arm away from the sphere and lock it down. Remove the ball cutter from the lathe.

Now sand the sphere to 320 grit. We don't want to apply pressure to the sphere after we finish turn the stem as we might break the stem. Complete the finish



**Photo 24** Turn and finish the stand

turning of the stem and foot, See **Photo 24**. Blend the stem into the sphere for a smooth transition. Sand the stem and foot to 320 grit. At this point there is a nub on the top of the sphere and the bottom of the base, or foot. Remove the piece from the lathe. I have a cup center I made to fit in my chuck and a flat tip that fits in my live center, See **Photo 25**. I use these to hold the sphere while grinding and sanding the nubs off. Limit the pressure you apply to the sphere as it is delicate. I start with an air grinder with a sphere burr



**Photo 26** Nubs removed



**Photo 27** Sphere ready for enhancements or finish



and rough off most of the nubs. I finish by sanding to 320 grit, both the top and the bottom, See **Photo 26**. The nub on the top is now gone as you can see. Removing the nub and sanding only took about three minutes.

The hollow sphere is now ready for any type of enhancements you want, if any, See **Photo 27**. Notice that the glue seam is almost invisible. This was due to having tight joints and the white Elmer's glue. For this piece I will pierce carve a design on the sphere and add a little airbrushing for color. No discussion of pierce carving or airbrushing will be done at this time. Just look at the finished product and get your thoughts flowing for your first hollow sphere.

Now its time to finish the hollow sphere. You can use any finish you want or are used to. I prefer Mohawk's Pre-Catalized Lacquer. It gives a very durable surface. I use mostly satin finish as this reduces the visibility of finger prints and dust. There is also a pre-catalized sanding sealer which I also use as the first coat of the process. Now complete the finishing and look at the finished product, See **Photo 28**. As I said not complicated at all. How many ideas are going through your mind at the moment? That's what articles and demos are supposed to accomplish. Now for education to seed you must apply the knowledge presented to you. As you can see from the various photos of different types of finished products the sky is endless in ways to incorporate the sphere in your designs.

I have included a list of suppliers that I use for supplies or that sell the tools shown in this article on the next page.

### **Photo 28**

This is the finished product with enhancements to the sphere. Doing enhancements to the sphere is what I enjoy. There is something magical about the sphere as it seems to ask for you to hold and touch it.

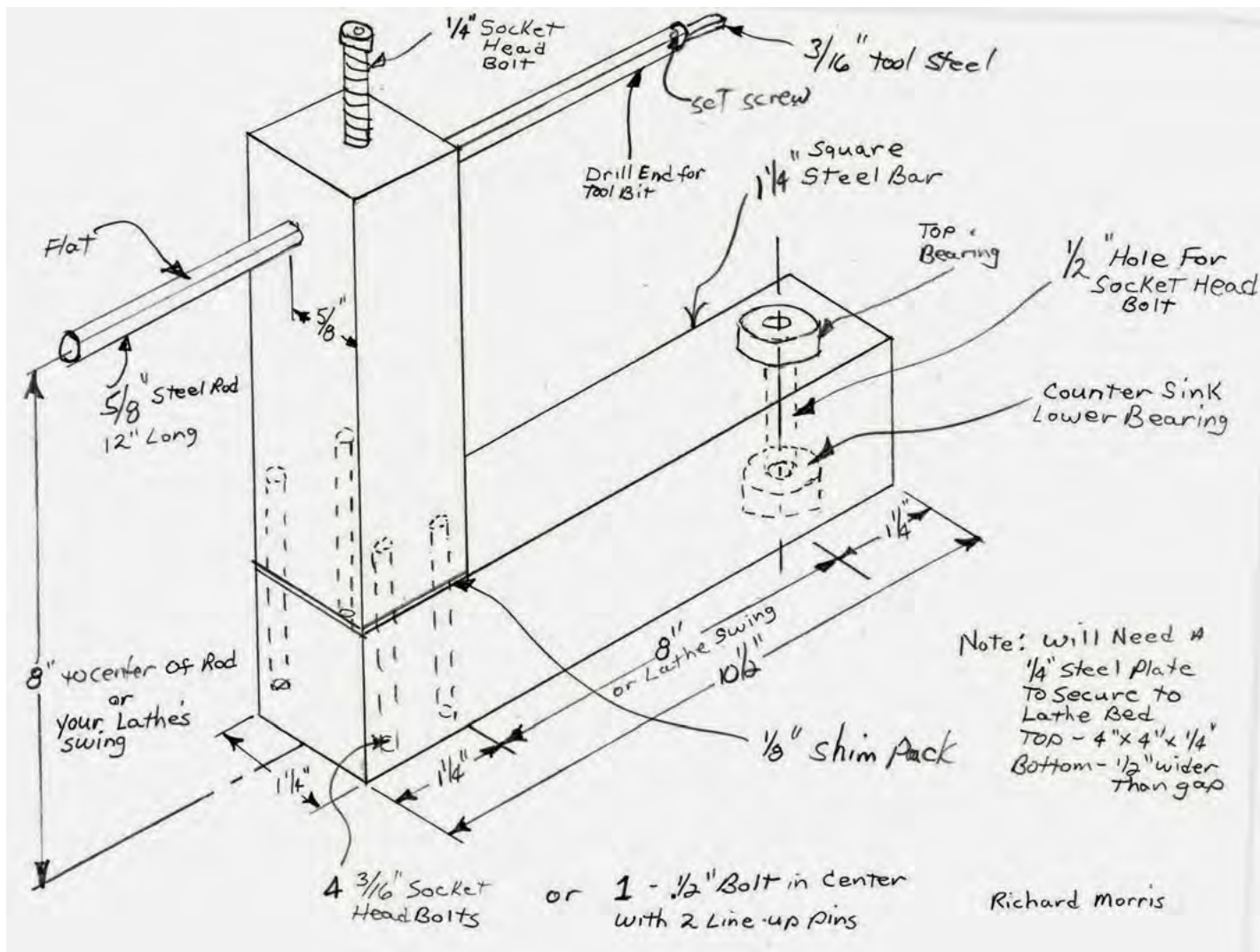


# Tools and Suppliers

Tools	Suppliers
Air Grinders - Drills - Cutter steel	Harbour Freight - <a href="http://www.harbourfreight.com">www.harbourfreight.com</a>
	Packard - <a href="http://www.packardswoodworks.com">www.packardswoodworks.com</a>
Glue	Home Depot
Sanding Supplies	Klingspore - <a href="http://www.woodworkingshop.com">www.woodworkingshop.com</a>
Plastic and Paper Circle Guides	Home made
Sphere Cutter	Packard - <a href="http://www.packardswoodworks.com">www.packardswoodworks.com</a>
	Lindsay Sphere Turning System
	<a href="http://www.lindsaylathetools.com">www.lindsaylathetools.com</a>
	Homemade



# Sketch of Sphere Tool



Excuse the crude drawing, but this will give you some idea. Make changes as needed for your lathe's swing and size. Notice the note to make attachments to secure this tool to your lathe's bed. A 1/4" plate for the top of the bed and a plate or commercially available clamp block for the bottom side of the bed.

## Quick List of Steps

1. Decide which style of sphere you want, sphere with separate stand, sphere with finials, or a sphere with built in stand.
2. Rough your wood to a cylinder of desired diameter for your design. Cut tenons on each end for a chuck.
3. Mark the center of the sphere on the cylinder. Mark a horizontal line across the center line. This will aid alignment of the grain when gluing the top back on the bottom. Cut the top half of the sphere from the bottom.
4. Place the top in a chuck. Measure the diameter in mm. The inside diameter will be 6mm less than outside.
5. Use a plastic or paper circle guide to measure the inside as you cut. Cut to the first line on the guide.
6. After the top is cut to fit the guide cut a 2mm step on the inside of the glue line.
7. Remove the top from the chuck and place the bottom in. Hollow the bottom as with the top except you need to cut the bottom 2mm deeper. Cut until the guide fits up to the second line on the guide. Then cut a 2mm step on the outside of the glue line. This step needs to be custom fitted to the top. Needs to be a snug fit for a strong joint.
8. Glue the top of the sphere to the bottom with white Elmer's glue for a clear glue joint. Use the horizontal line to align the grain.
9. Mark the top and bottom of the sphere with a line all the way around the cylinder. This will be half of the diameter on either side of the glue line.
10. Cut the shoulders of the sphere down to the rough size of the stem, approx. 1" or whatever your design dimensions. Rough out the stand base and stem, also the nub on the top of the sphere.
11. Remove piece from the chuck and remove the chuck. Place the taper extender back in the head stock. Place the piece back between centers.
12. Rough off the corners of the sphere with a gouge. Just get close and don't over do it. Leave the pencil line at the glue joint showing for reference.
13. Setup the sphere cutter. Square the cutter to the bed of the lathe. Center the sphere cutter to the glue joint of the sphere.
14. Pull cutter arm back until it just clears both the top and bottom of the roughed out sphere. Move cutter back to the center. Slide cutter arm in toward the glue joint ever so slightly, 1/32". Turn lathe on and swing the cutter arm back and forth until the cut is done. Repeat this until the glue joint is just cleaned up.
15. Sand the sphere to 320 grit. Turn the stem and base to design and sand to 320.
16. Remove the sphere from the lathe. Place the chuck with a wooden cup center on the lathe. Use the cup and live center with a flat to hold the sphere so the nub can be sanded off. Remove the top and bottom nubs and sand to 320 grit.
17. Finish as desired. Maybe a little pierce carving or airbrushing. Maybe no enhancements. Your design.