# Sphere within a Sphere

# A Couple of Points

This demo will give you a good overview of the process of making a Sphere within a Sphere.  Though remember as you read the descriptions they are just talking points for the presentation.

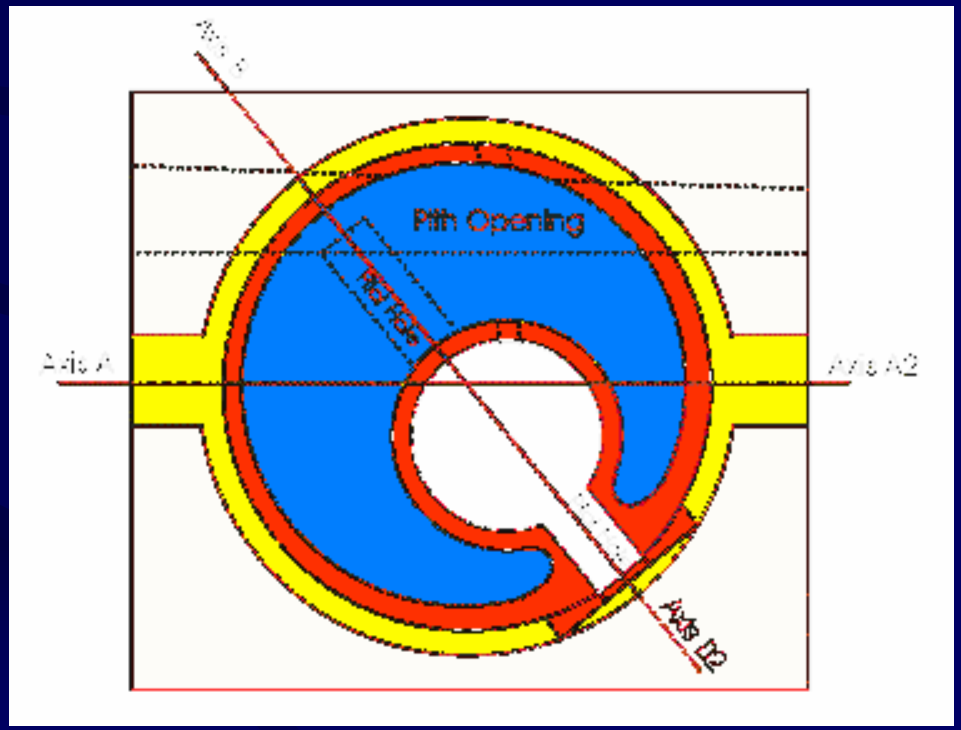
There are many ways of doing this idea. I choice not to rely on rigs or lasers, because I wanted to raise my level of awareness by focusing all your senses on the piece.

I learned a great deal by doing this piece.  I hope you gain something from it also.

# Goals of this Presentation

- **Teach you how to make a Sphere within a Sphere.**

- **Take you through some of my thought processes during a turning project.**



# General Concepts

- Ornamental sculpture “abstract”
- Themes  are also helpful to convey ideas.
- Try to convey an idea that would stimulate an emotion or a thought from a new point of view.
- Making everything relate: i.e. size, shape, thickness, color, finish and so on.
- It is always good to have a plan just so there is something to change.
- Finally, it will be really cool if it works

# General Physical Plan

- An organic exterior with recognizable patterns that we see in nature.
- Make the exterior surface harsh but still pleasing to the eye.

# General Physical Plan

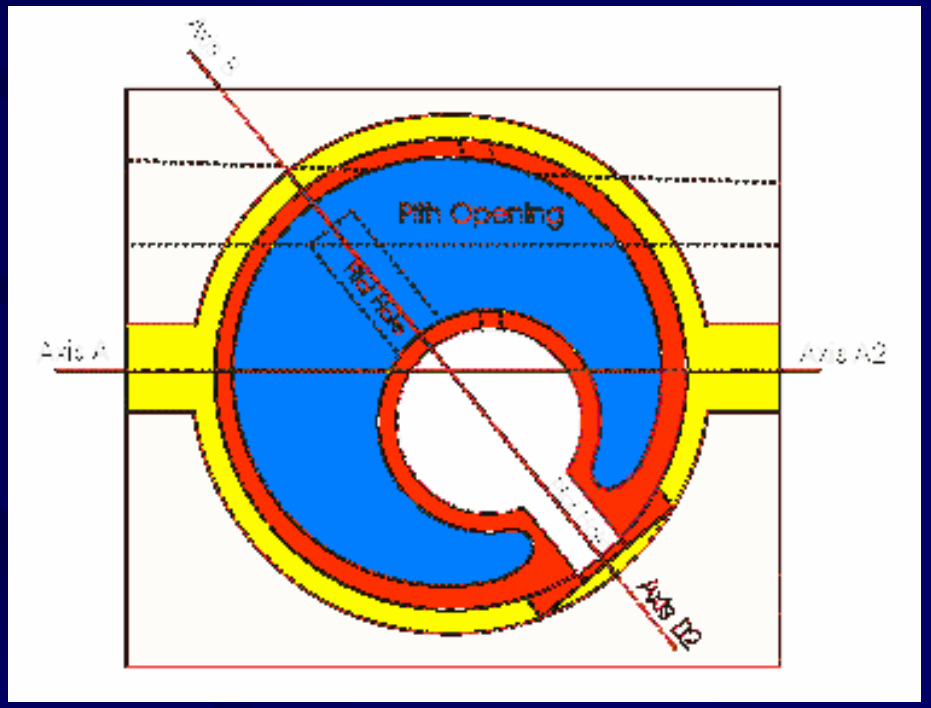
- The interior: By contrast it is very smooth and lightly colored but still revealing the natural figure of the wood.
- The sphere is also lifted off the bottom so it appears to be floating in the outer sphere.

# Disclaimer

- I do not guarantee that the techniques are safe.

# Structure of the Piece

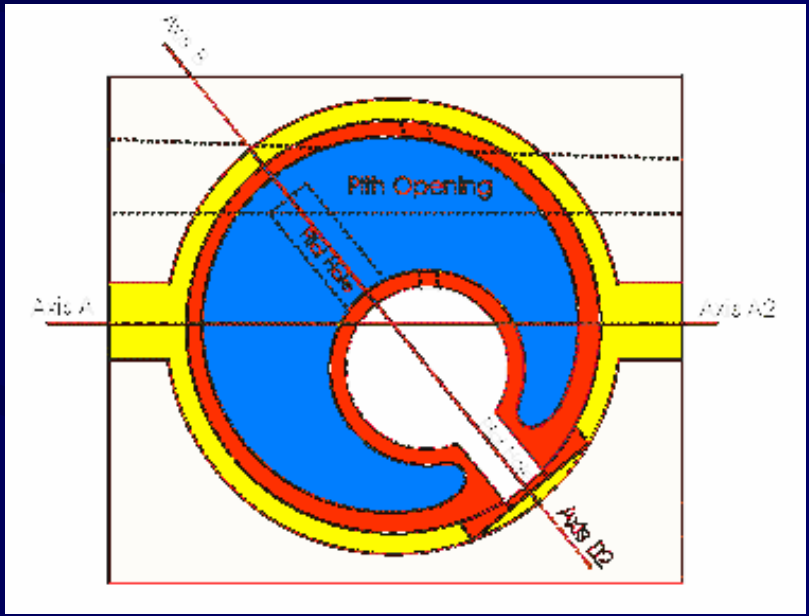
- The exterior wall is  10.5 inches in diameter and 5/8 of an inch thick
- The bottom where the inner sphere attaches is thicker at 1-inch thick.
- The inner sphere is 5-inches in diameter and the wall are approx. 3/8-inch thick.



# Overview

**10 Steps to making a Sphere within a sphere**

- .On axis A turn the first sphere.
- .Rotate the sphere to axis B mounting in the chuck and axis B2 in the tailstock
- .Turn down the foot on the axis B2 side.
- .Flip the foot around and mount in the chuck.
- .Drill the pilot hole to the inner sphere.
- .Hollow out the outer sphere around the inner sphere.
- .On axis B flip the sphere again putting it in a donut (a device that holds the sphere in pace).
- .Shave down the foot
- .Drill pilot hole for the hollowing of the inner sphere.
- Hollow the inner sphere by starting at the top of the sphere and work your way back to the base.



# Selecting the log

- Plum Log
- Paulownia Log
- Using the log's pith natural opening as the entry of the sphere.

# Cutting the blank

- I use an electric chain saw to cut out the blank.
- The blank is a 13 inch cylinder
- Save the scraps for making tools and test pieces.

# Mounting the blank

- The tool rest is trapped in-between the head stock and the blank.
- Work the tool rest over as you cut the blank to 13 inch cylinder.

# Marking the cylinder

- In marking your blank consider the grain figure that you want in the piece and defects you want out of the piece.

# Cutting out the Sphere

- Make an ll.5 inch half circle template.

# Cut off the sphere

- You could turn the nubs off when you remount it, but it is safer with a smaller nub.

# Remounting the Sphere

- Turn the sphere 30 degrees and mount the sphere in the pith opening.
- Use an expansion chuck (the chuck only touches two sides of the opening)
- Bring the tail stock in for support.
- CA glued the cracks and the pith opening before mounting.

# Making the foot

- Make another circle template 10.5 inches
- True up the sphere again..
- Then cut down an additional I/2 inch off the sphere to make the foot
- Tip: rounding the sphere use a direct light to show up any imperfections.

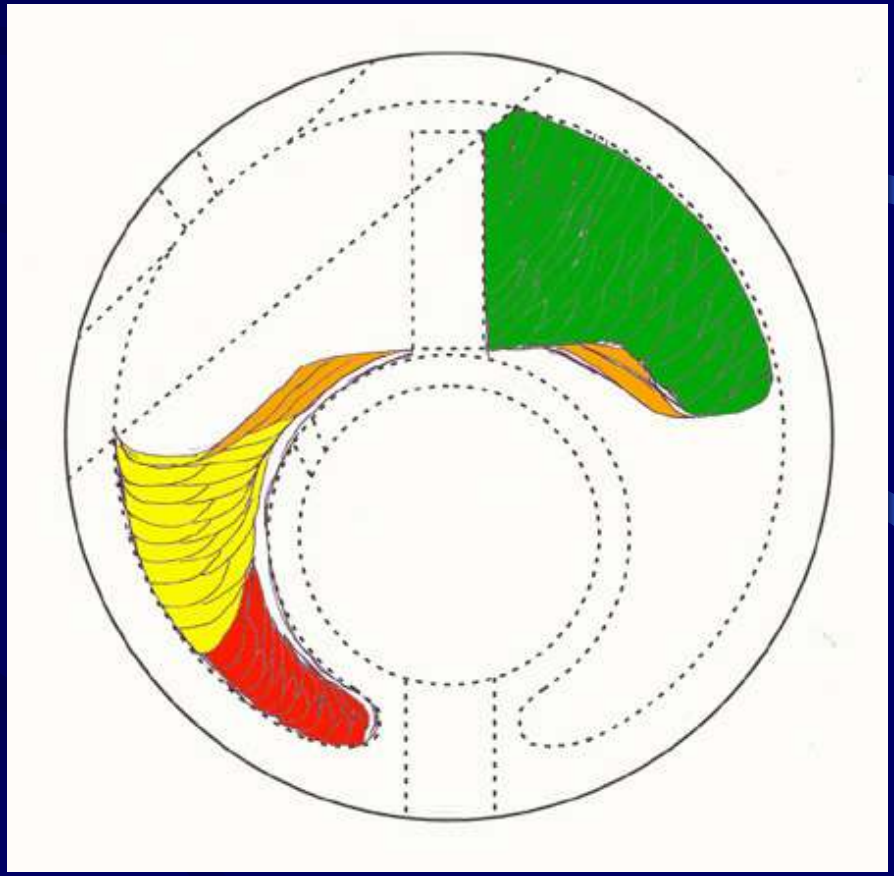
# Mount the foot

# Drill depth for inner Sphere

- Use a drill chuck in the tailstock.
- 3/4 inch mortise drill bit with an extension.
- Mark the bit to the depth you will drill
- Drill about 1/2 the distance of the outer sphere (many options)

# Hollowing Diagram

- Green:. This section is hollowed out as you would any vessel .
- I used the Kelton 3/4 inch straight and medium hook scraper for this section.
- Work down to the depth of the pilot hole then cut perpendicular to the width of the inner sphere.
- Starting at the width of the inner sphere cut a cylinder / cone shape down towards the apex of the inner sphere.

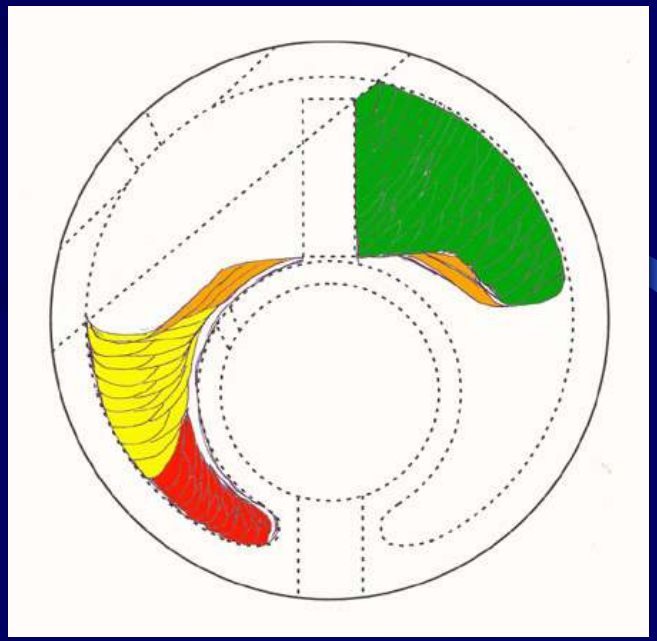


# Warning

- Tighten allen screw to the chuck and sleeve to the lathe before turning in reverse.

# Hollowing Diagram

- Orange: With the Kelton scraper shaving down to the inner sphere. Check the inner sphere with this template start.
- In order to get to the apex of the inner sphere you need to go in reverse for the scraper to reach the surface.

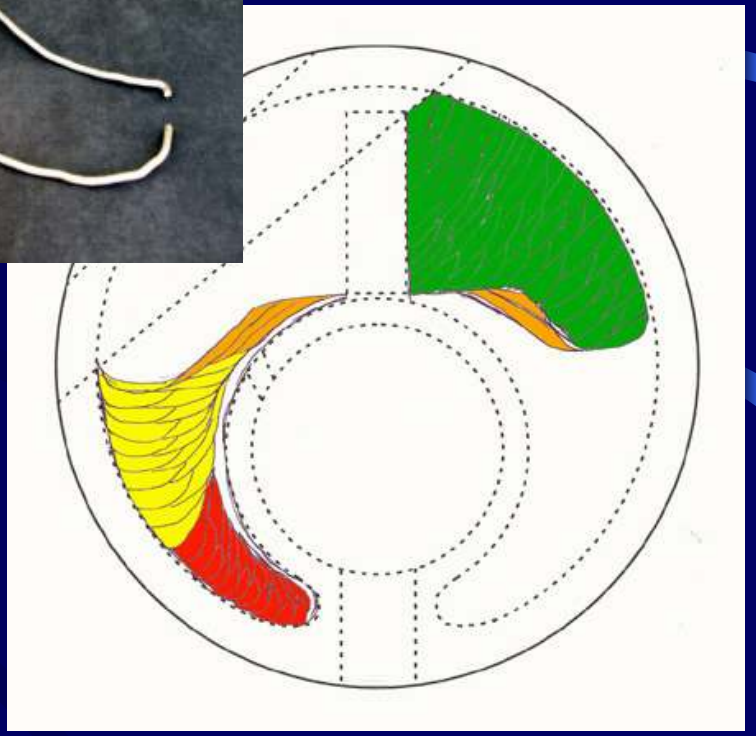


# Checking inner sphere

- Tip: Mark the sphere where it touches the template and then position the scraper to that point. (Lathe off)
- Leave the nipple at the top of the sphere.  This is used as a reference point later.

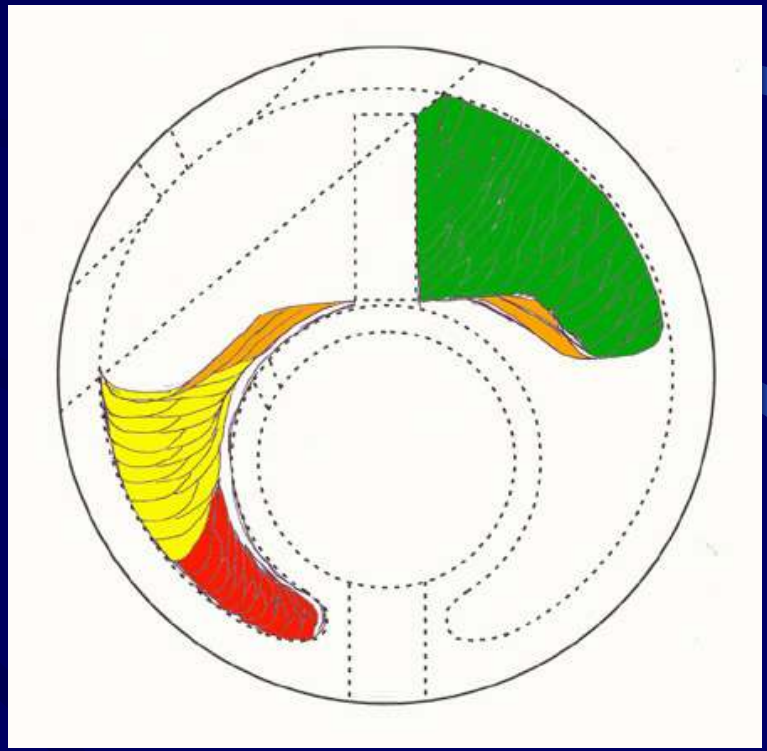
# Hollowing Diagram

- Yellow: Using a Kelton 3/4 inch medium curved scrapper alternate from the outer sphere cut to the inner sphere cut.
- Check often with the inner sphere template.
- Outer wall: Check thickness with a bent 1/8 or 3/16 inch rode.
- Finishing scrapes go back towards you on the outer sphere's inner wall and away on the inner sphere.



# Hollowing Diagram

- Red: In order to reach this section some scrapers will need to be made.
- Continue in reverse scraping from the outer wall towards the the inner sphere.
- To check the inner sphere another template will need to be made. "side inner sphere template"
- I slow down the lathe to about 450rpms and using a 3/16 tip to scrape helps prevents a catch.



# Turning the inner sphere hollow

# Making the donut

- The only thing unique about this donut is the 3/4 inch opening to the headstock needed to line up the inner sphere.

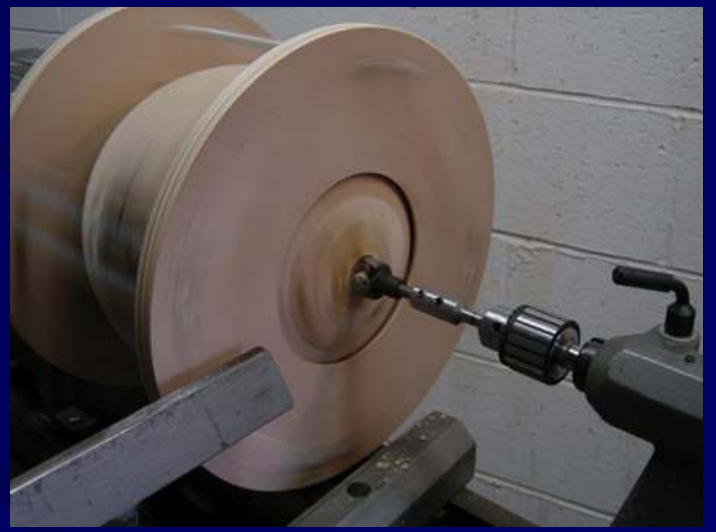
# Finding the center

- To center the piece use the nipple that was left on the inner sphere and the tailstock.
- Reinsert the tailstock in the  previous mark made by the tail stock when the foot was turned.
- Looking through the knockout opening line up the inner sphere by spinning the lathe by hand and adjust the sphere until the nipple is centered.
- Then tighten down the donut to the sphere.
- Tip: attach a small flashlight to the donut and shine it on the inner sphere.

# Finding the center

# Drill opening hole for inner sphere

- Drill the opening in the inner sphere.
- Shave the foot off.
- Find the depth of the inside of the inner sphere.
  (A) Drill depth to inner sphere plus (B) inner sphere wall thickness minus (C) outer diameter.
  A+B-C= drill depth to hollow inner sphere



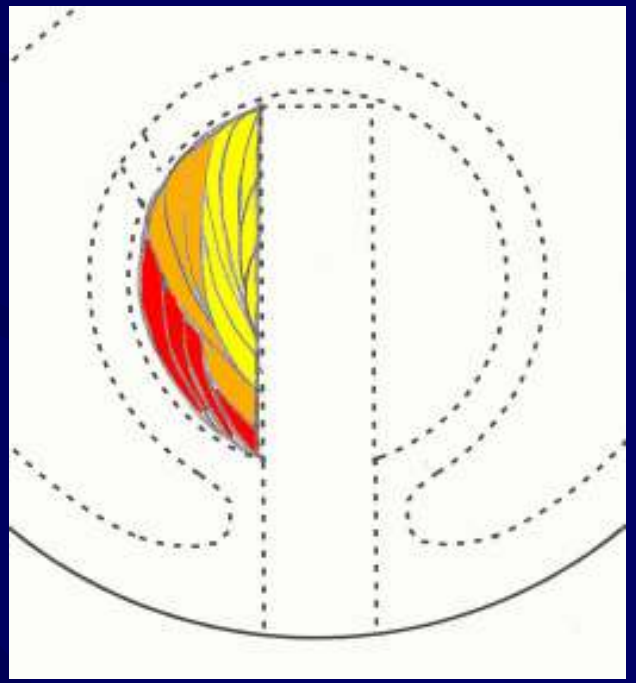
# Hollowing the inner Sphere

- Determine the inner sphere hollowing diameter.

  In this case double wall thickness and subtract the inner spheres diameter.
- mark the min, max and center on the scraper.

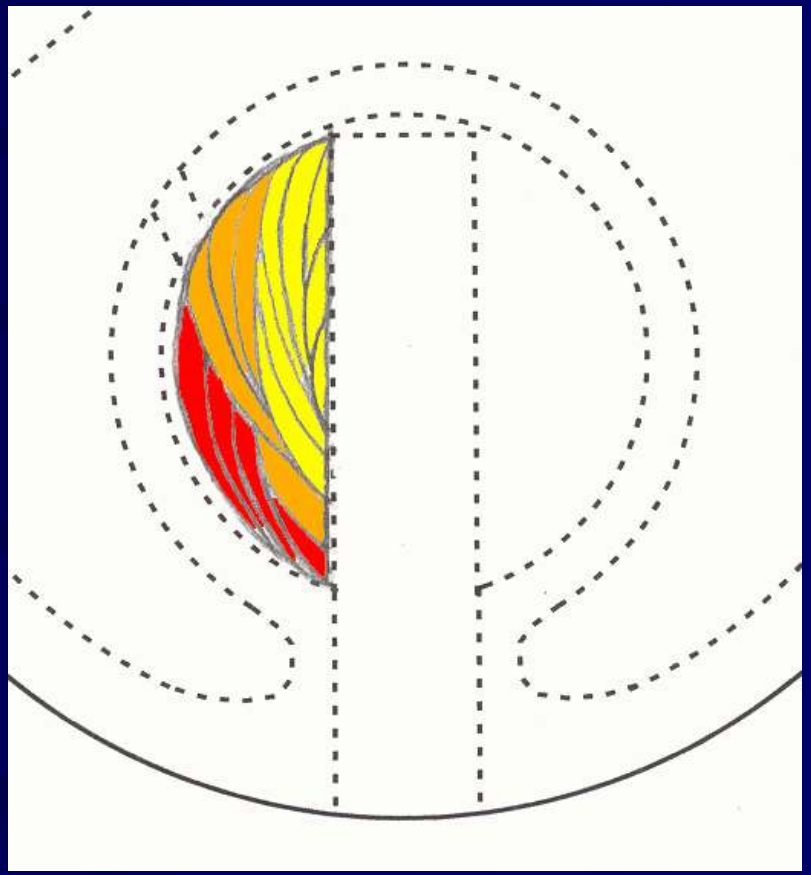
# Hollowing Pattern

- Yellow: Widen the pilot hole.
- Orange: Work from the top of the sphere back to the base. This is so you maintain the mass to support your cuts.
- Make a clean out tool that is the radius of the hollow opening



# Hollowing Pattern

- Red: Check with the clean out tool. Then hollow out towards the base of the sphere.
- Listen to the sound of the wall. The higher the pitch the thinner the wall.



# Sanding

# Making the tools

- The sanding tools are offset to help relieve the possibility of catching the tool. This allows you to control the torque.
- The sanding surfaces are cut to the radius of the wall.
- Handles were made from the scraps and padded out with loop Velcro.

# Sanding the inner wall

- With the sphere on the lathe start sanding.
- Only the bottom half can be done on the lathe.
- The bottom will need to be finished by hand sanding to remove the rings created by the lathe.

# Sanding the inner sphere

- Make a tool to reach the sphere and have the sanding surface the same radius as the sphere.
- This sanding tool can reach the top and bottom by turning the sanding head around.
- A rubber band is attached to the metal arm and the eye screw for tension
- You can also adjust the tension by raising and lowering sanding head.

# Creating the outer surface

- Test pieces
- Work with the figure of the wood
- Use directional lighting to help reveal the shape.


# Dyeing

- The inside of the outer sphere is dyed with aniline dyes
- Brush and sponge on.

# The End