

Egg-Forms on the Lathe

Prepared by Tom Willing

Northwest Woodturners
April 02, 2020

I. Introduction and Disclaimer

This handout has been created to accompany a demonstration presented at a regular meeting of Northwest Woodturners, an American Association of Woodturners (AAW) affiliate in Portland, Oregon. Neither the club nor the author makes any representations whatever regarding the advisability or the safety of the techniques presented in this handout. All woodworking activities bear the risk of injury or death. No one should use power or hand tools without first studying and learning their safe and proper use. Read and apply manufacturers' instructions for machinery, tool, and equipment use; follow shop safety rules; use appropriate personal safety equipment to protect the eyes, ears, lungs, and body, of everyone in the workspace.

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II. Introduction

This guide to turning egg forms on a lathe was originally prepared for a demonstration at a regular meeting of the Northwest Woodturners by the author in 2017. It should serve well as a detailed guide for the intermediate turner seeking to advance his or her skills. Covered are materials, tools, aesthetics and design, as well as safety. Included are a variety of alternative techniques. The approaches presented are not the only ways of doing things, nor are they at all unknown; I know many turners for whom this is familiar ground and I am grateful for all they have taught me over the years.

Egg forms occur throughout the natural world, so it is only fitting that anyone with access to a lathe should learn how to turn them, in fact, egg forms make excellent practice exercises for honing one's tool handling and observational skills. While the timing of the original presentation was intended to serve those who celebrate Easter with an egg hunt, human cultures have revered ovoid forms for millennia, associating them with fertility and renewal. Human makers have adopted ovoid forms in their art using wood, glass, metal of all sorts, ceramics, textiles, and stone. Ovoid shapes and forms appear in Paleolithic Era cave paintings, and the roots of Ukrainian egg dying go back more than 5,000 years.

In engineering terms, ovoid forms have an incredible strength-to-weight ratio under compression. As long as one keeps the pressure evenly distributed, it requires considerable strength to crush an egg by squeezing it in your hand. When engineers want to design lightweight hydro-dams, tanks, and pressure vessels, ovoids usually come up. Ovoid forms do not typically roll in a straight line, making them ideal in situations where, for example rolling away from the center of the nest can be problematic.

This demo focuses on wood as the best medium available to most wood turners, but one can use other materials on a woodturning lathe, using woodturning tools. The same acrylics and resins used to turn pens and bottle stoppers are appropriate material for eggs. Alabaster and soapstone, while requiring slightly different tool handling techniques, can be worked using many of the tools used to turn wood. Nor are egg forms immune to surface decoration, although we will not go into that here in the interest of time. It is great fun to leave that part to the children if available.

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There are a few things not covered. I have presumed that readers already know how to properly set up a lathe, sharpen tools, select and use the correct tool for the cut intended, and apply chosen finishes. Some terminology used might be unfamiliar, depending on the reader's experience, education, and professional background. Feel free to ask questions. Particularly when in doubt, raise your hand, make the call, or send the email before flipping on the power switch to your lathe.

My thanks to Mike Porter, former NWWT Vice President, for his help with creating this packet, and to Roger Crooks and Mike Meredith for faith in my presentations.

III. Equipment

Lathe.

- 1) Any properly set up lathe will work. We won't go into lathe set-up here more than to say that you should regularly check things like electrical system integrity, alignment, leveling, and lubrication, etc. Always be sure your lathe is not soiled or fouled with debris, finishing oils, etc. If you get into really large eggs, size of the lathe could become an issue, but the focus here is on egg forms under four inches long. My recommendation is that you learn how to turn a three-inch egg first. Smaller is more challenging, so try that as soon as you catch yourself getting cocky about medium sizes. Then, move to the big stuff, which presents different challenges.

Accessories

- 1) It is not necessary to have expensive scroll chucks and fancy devices in order to turn an egg form. One can turn egg forms between centers and have very little cleanup to do after final parting off if one is careful.
- 2) Before the days of precision engineered scroll chucks, eggs were turned between centers and finished by hand, or held in "jam chucks" on faceplates for the final finishing steps. A scroll chuck is a convenient and flexible way to mount and accurately center a cup chuck, but it is not essential. A few very simple, shop made fixing devices are all one needs.
- 3) Of course, every wood turner has a certain amount of tool junkie lurking about in the nether regions of her/his soul, so most of us have sprung for at least one scroll chuck. If you have a scroll chuck, by all means use it! Just remember that even when manufacturers say their chucks won't gum up with oils and dust, all woodturning projects benefit from good chuck hygiene.

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Material Selection

- 1) While learning and building confidence, use medium-hard species such as Cherry, Maple, or Ash that is well-seasoned and free of defects;
- 2) As you gain experience, move into Walnut, Myrtlewood, and harder softwoods like juniper;
- 3) Save the expensive exotics until you have time, composure, and some solid practice under your belt;
- 4) If you round your bowl blanks on the bandsaw, save the corners to make eggs, cutting them down to face-grain-mounted pieces, BUT rough them to round using your small bowl gouge, NOT a spindle roughing gouge! For safety reasons, be 125% sure you understand this before you try it!
- 5) Voids, inclusions, natural edges – all provide interesting opportunities for the egg turner; however, these features significantly change the ability of jam chucks to securely hold the workpiece. Take caution! Stay out of the line of fire. Clear your shop of any lurking lookie-loos.

Cutlery – Sharp Cutlery!

- 1) Spindle roughing gouge (see 6. Below)
- 2) Spindle detail gouge (see 6. Below)

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- 3) Skew(s)
- 4) Parting tool
- 5) Abrasives
- 6) Comment on Tool Selection
 - (a) When mounting a work piece for an egg in face grain orientation, that is, with the grain running perpendicular to the axis of the lathe, a smaller (3/8") deep fluted bowl gouge with an Irish, or swept-back grind should be substituted for 1. and 2 for better results.
 - (b) Never use a spindle roughing gouge on material mounted in face grain orientation.

Finishing – Use what gives you the finish you like.

- 1) Oil
- 2) Wax
- 3) Polyurethane
 - (a) Brush-on
 - (b) Wipe-on
- 4) Friction Polish
Spray Lacquers
- 5) Comment on Finishes
 - (a) I prefer oil and beeswax finishes because of blending and drying considerations. Small contact defects in an oil or wax finish are easy to buff out with steel wool, or even a soft rag.

Notes:

IV. Step-by-step process for turning the egg between centers (See Part V for scroll chuck methods.)

- A) Mount a squared-up block of Maple, Cherry, or similar even density wood, 60 to 80mm square by 100 to 120mm long, between centers;
- B) Running the lathe at between 800 and 1200 rpm, rough the block to cylindrical using your roughing gouge or other accustomed tool for the task;
- C) Face off the ends of the cylinder as close as the center points allow;
- D) As the work piece becomes cylindrical and balanced, you can also raise the spindle speed to between 1600 to 1800 rpm – the bigger the diameter, the slower the rpm);
- E) With the lathe running, make a pencil line to mark the ends and the equator (plane of largest diameter of the form) of your egg. The position of the equator line needn't be precise, but many turners use the Golden Ratio (1:1.618) to position it. A Laying hen uses a ratio of about 1:1.35±. I usually position the larger end of the egg to my right to begin with, but either way works;
- F) Use your spindle detail gouge and/or your skew to begin forming the egg;
- G) Continue forming the egg, making room to work at the ends by cutting away the waste portions of the cylinder as you go;
- H) As the ends of the egg become more defined, begin making your cuts lighter;
- I) As the ovoid emerges under the edge of your tool, make your cuts sweep from equator to pole in one fluid movement of legs and body;
- J) When the egg is attached only by a narrow diameter spigot (5mm ±, enough to securely hold the egg) at either end, refine the surface as much as possible with your detail gouge and/or skew;
- K) When you have the main parts of the egg refined to your satisfaction, sand out the egg to whatever grit you choose;
- L) Alternating between ends of the egg, use your skew or a parting tool to part the waste off the ends of the egg. **NOTE:** If you part the egg all of the way off with a parting tool, it is VERY difficult to do so without “plucking” a small hole in the end of the egg where the wood fibers rip away. This hole can be puttied, then sanded smooth, but the spot will always be visible in the finished egg. To solve this, you can stop the lathe, and use the point of your skew, a sharp saw or carving chisel to complete your parting off.
- M) Once the egg is free of the waste spigot at either end, use a sharp carving chisel or knife to finish forming the extreme ends of the egg;
- N) Hand-sand the parted ends to the same level of finish as used on the rest of the egg;
- O) Apply your finish of choice.

Notes:

V. Step-by-step Process of Turning an Egg Using a Scroll Chuck

- A) Mount a squared-up block of Maple, Cherry, or similar even density wood, 60 to 80mm square by 100 to 120mm long, between centers;
- B) Rough the block to cylindrical using your roughing gouge or other accustomed tool;
- C) Face off the ends of the cylinder as close as the center points will allow;
- D) Form a spigot suitable to fit your chuck jaws on one end of the workpiece;
- E) If your block is 10 to 15mm larger in diameter than the egg you plan to wind up with, make it 160 to 180mm long, which will allow for a waste block for making a friction-fit, cup, or jam chuck later on;

Safety Note: Always form your spigot to fit the specific diameter and profile of the chuck jaws you are using. A proper fit reduces the chance of a work piece popping out of the chuck, as well as reducing vibration. Your work piece should have the minimum dimension necessary to form a complete spigot, one that has no flats or voids under the jaws. The spigot should have a shoulder that rests firmly on the tops of all four jaws; it should not bottom out in the chuck. If you have profiled jaws, assure that the spigot is long enough for the jaws to make firm contact on multiple profiles, not just the first one. Dovetail spigots should match the taper of the dovetail jaws you are using. Lastly, make the diameter of your spigot appropriate to the diameter of the jaws. The best contact is made when the jaws do not quite close completely around the spigot when tight, leaving a 1mm to 2mm gap between the jaws when the work piece is mounted. Improper fit between spigot and jaws leads to failure (crushing and/or separation) of the wood fibers, leading to uncontrolled departure of the work piece from the chuck.

- F) Remove the cylinder from the lathe and remove the drive center from the spindle, but keep the tailstock center in place in the tailstock for later use;
- G) Mount your scroll chuck on your drive spindle;
- H) Mount the spigot in your chuck and re-true the length and the exposed end;
- I) With the lathe running, make a pencil line to mark the ends and the equator (plane of largest diameter of the form) of your egg. The position of the equator line needn't be precise, but many turners use the Golden Ratio (1:1.618) to position it. I usually position the larger end of the egg to my right, but either way works;
- J) Use your spindle detail gouge and/or your skew to begin forming the accessible end of your work piece into one end of the egg. NOTE: it is pretty much a matter of personal preference whether you form the "big" end, or the "little" end first. I form the large end to the right and the little end to the left, which allows me to make a little more room to work as I go at the left end, while conserving more material for making the friction fit chuck later on;
- K) Continue forming the egg, making room to work by cutting away the waste portions of the cylinder as you go, BUT leave as much length of material on the spigot end of the piece as possible for forming the cup on your friction fit chuck, which needs to be a little deeper than half the length of the egg;

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- L) Form the egg for as much of its length as possible, working the left side down to the point where you can tell where remaining material will have to be cut away;
- M) As the egg form evolves, you can also raise the spindle rotation speed. Between 1600 and 1800 for 2" to 3" long eggs works well;
- N) When the egg is still attached by a spigot heavy enough to securely hold it (10mm ±), refine the surface as much as possible with your detail gouge and/or skew;
- O) When you have the right hand and middle portions of the egg refined to your satisfaction, sand out the egg to whatever grit you choose;
- P) Use your skew, detail gouge, or a parting tool to reduce the diameter of the egg at the left-hand end – leave a little extra material. REMINDER: If you are not careful at this point, it is easy to “pluck” a small hole in the end of the egg where the wood fibers rip away. The hole can be filled, then sanded away, or you can stop short of fully parting off the egg, stop the lathe, and use the point of a skew, a sharp saw, or a carving chisel to finish the last bit.

- Q) **Trick (if your live center point is removable):** As you part off the egg from the chuck, leave a small cone sitting on the left end of the egg to fit into the tapered hole in the nose of your live center, which will help you center your egg in your friction fit chuck using your tailstock. This trick also allows you to press the egg into the cup chuck with your tailstock spindle instead of beating on it with hand or tool. If the point of your live center is not removable, fashion a friction-fit cup chuck to go over the end of the live center;
- R) At this point, you can complete the egg by hand in the same way you did in Part IV, or you can make a friction fit chuck which allows you to reverse the egg on your lathe and finish the second end of the egg the same way you did the first end, saving a lot of time and improving your finished egg;
- S) Once the egg is parted off, the waste piece still mounted in your scroll chuck becomes your friction fit chuck, if it is long enough and large enough in diameter;
- T) Make a true face on the workpiece using your skew or detail gouge;
- U) Use pointed calipers or vernier calipers to measure the maximum diameter of your egg;
- V) Use your detail gouge or a small scraper to hollow a cup in the friction-fit chuck block. Remove enough waste that the egg cannot bottom out in the cup. The inside diameter of the cup at its largest diameter must be slightly larger than the outside diameter of the egg, then gradually taper so that a friction fit is created when the egg is forced into the cup. Try for a taper that is between one and two degrees for hardwoods, between two and three degrees for softwoods. Some turners bore a hole, 10mm to 20mm in diameter, all the way through the cup chuck to allow for knocking out the egg if it gets stuck too tight to remove in other ways. Others will mark the depth of the cup on the outside to show where to part it off without damaging the egg, if necessary; however, this latter approach usually makes it impossible to re-use the chuck for another egg;
- W) Position the cone remaining on the end of the egg to the right as you apply light pressure against the egg with your hand to press it into the cup chuck. “Sneak up on

VI. Discussion Points, Tips and Traps

- A) Turned eggs are purely decorative in function, unless you want to put one in the nesting box, as we do at our house, to decoy the girls into laying there instead of out in the bushes. Consequently, material selection can be very important. Even though burl, spalt, figure, and voids are more difficult to handle on the lathe, it is well worth the effort of learning how to handle them. The best advice is to keep your tools sharp. Next is probably to run your lathe at an optimum speed, which is variable because every interesting piece of wood comes with a different optimum turning speed.
- B) Five tools are listed in the Cutlery section, above. The intermediate turner will most likely rely on the spindle detail gouge most, but there are no absolutes here. A deep-fluted bowl gouge with a swept back grind is very effective in the right hands. I also know turners who can create eggs and tops with nothing but a skew, from rough-out to final cut. Mastery of the skew requires dedication to practice combined with nerves less easily frayed; however, a skew just leaves too good a finish to pass up. If production speed is a main concern, then go for tools that you can use at speed, comfortably, safely, and without fraying your nerves.
- C) The cup chuck approach is more involved, but assures a better end result, so I find it worthwhile. Surface irregularities in an egg form are 1), easy to spot when the egg is stationary, and 2), difficult to remove by hand completely. It is far easier to refine the form on the lathe if you can securely hold your work piece by just one end.
- D) You can make a cup chuck in either an end grain or cross grain orientation. If you choose to make one in the cross grain orientation, a bowl gouge will work far better for the hollowing, while the process of fitting ever increasing diameters of eggs will eventually leave you with a small bowl form that is ready for final cuts, some finish, and a fistful of nuts or crackers when it will no longer grip an egg safely. The advantage of the end grain orientation is that it is less likely to split under the pressure of forcing the egg into it if the walls of the cup are thin.
- E) Make and keep a collection of cup chucks so that you can mount up and adjust the one that almost fits rather than having to make a new one for every egg. In time, the walls will be worked down until they are too thin and fail under pressure, at which point the piece becomes a candidate for conversion to BTU's in the woodstove.
- F) If a friction fit is too tight, you may have difficulty removing your egg from the cup chuck. A gentle pat on the assembly with your hand, evenly distributed between cup and egg will often do the trick. If that fails, try gently "bopping" the cup chuck (dent the chuck, not your egg!) with the handle of a turning tool. If you have applied more brute force and awkwardness than finesse so that nothing else works, make a parting cut at the bottom of the cup chuck, being careful not to nick your egg as you part through. Then you only have to apply pressure to the now-exposed end of the egg to push it out of the napkin ring you just made. You can also head off the problem completely by boring a hole, 10mm to 20mm in diameter, all the way through the cup chuck block, before fitting the egg, to allow for knocking out the egg with a knock-out bar if it gets stuck too tight to remove in other ways.

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- G) A loose fit is less forgiving than a tight one. One can use a layer – one thickness – of paper towel to make a fit a bit tighter. Wetting the inside of a cup chuck will make it tighten up on an egg as long as the fit isn't too loose. The most likely reason for a loose fit, though, is incompatibility between the profiles of the cup and the egg. Wiping the egg with finishing oil and inserting it into a dry, un-oiled cup chuck will mark where the egg and the cup meet. The wider the ring of oil mark in the cup, the better the fit should be, AS LONG as they meet within a few degrees of the lathe axis, and they come together compatibly. Be careful about the egg bottoming out in the cup.
- H) Some turners like to hang eggs like an ornament. Installing a screw eye is very easy if you drill a small hole in the egg before you remove it from the cup chuck.
- I) If you are at all like me, you sometimes will nick or mar a piece at the very last stages. If this happens to you, DON'T throw your egg out. Just put it back in your cup chuck and recut it. It will remount back in the cup, either way first (you might have to add a little depth to the cup to accommodate small-end-first mounting), and even though you might not get it centered precisely, the surface will "fair-in" as you rework and sand it out;
- J) If the problem you need to repair is obscured by the cup chuck (skew catches have a tendency to run a long way across your egg), make a wooden drive cup with a #2 Morse taper for your drive spindle and a simple wooden fitment to put over the nose of your live center. These two fitments will leave fewer marks on the surface of the egg if their inside profile is reversed like the bell of a clarinet or a trumpet. These two fitments will allow you to place the egg between centers so that the middle portion is accessible to your tools and fingers. If you get a compression dent or burn ring on either end of the egg, simply pop it back into the cup chuck and sand it out. I also keep leather pads in my kit to reduce marking.
- K) Sourcing your material can be as simple as walking over to the wood pile or popping the lid off the scrap bin and digging around amongst the offcuts you've been tossing in there, just knowing there was a good reason not to get rid of them yet. Every bowl blank that you cut the corners off of has an egg waiting in each corner. You can orient your egg in the grain any way you choose; just remember to take grain orientation into account when selecting which tool to use. Select the appropriate tool for the grain orientation.
- L) The aesthetics of egg form deserves an entire page all its own, but I'll condense things a little. Note that I distinguish between: shape, having to do with 2-dimensional design; and form, having to do with 3-dimensional design.
- M) Egg forms have a continuously changing formula defining the curve of their profiles. At no point does an egg form have a flat or rumped profile. To achieve a true egg form profile, a turner must find a way to dance with both tool and machine. Three firm points of contact for the tool (usually work piece, tool rest, and forearm, hip, or waist) for most cuts is critical. Working from slightly relaxed joints – no locked-up tension – allows the cut to flow smoothly through complex profiles. Mastering an egg's fair curves is transferable to every shearing cut you make on your lathe. One of the reasons egg forms are excellent practice for woodturners is that your work will tell you if you have the dance down. Turn an egg without sanding it. Finish it, then

