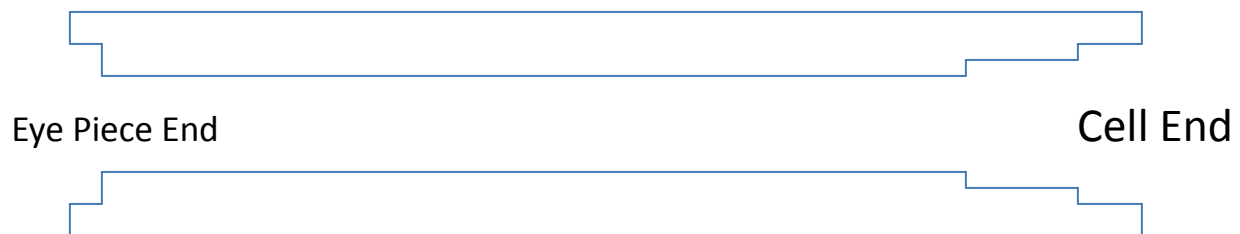


MAKING A SIMPLE KALEIDOSCOPE

1. Start with a blank that is the length of your mirrors (ours are 8") plus the length of your cell (ours is 5/8 inch) plus 1/2-3/4 inch, and at least 2 inches x 2 inches. 2 1/2 inches square is better.
2. Put the blank between centers and turn a tenon on each end to fit in your chuck. Firmly chuck your piece bracing it with the tailstock. Make sure there is no wobble when the tailstock is removed.
3. Mount a forstner bit in a Jacob's chuck (we used a 1" bit). Mount the Jacob's chuck in the tailpiece and drill into the end grain to the depth of the bit. Be sure that you begin drilling in the exact hole made by the live center when you made the tenon. You should back out the bit frequently to remove the shavings. (we backed about every 10 cranks on the tailstock.) Then mount the forstner bit in the bit extender and continue drilling and backing out until the piece is drilled through. You may need to back out more often using the bit extender. Don't jam the forstner bit into the blank.
4. When the hole is through, leave the blank in the chuck. In the manner best suited to the occasion, widen the hole to fit your cell. Make the hole deep enough to include the cell and a keeper ring.
5. Remove the piece from the chuck and turn it around to chuck the other end. While the hole on the cell end will be centered, the hole on the eyepiece end may have drifted off center slightly. Use a cone center to center the eyepiece end before tightening the chuck. This will help center the eyepiece on the finished kaleidoscope. In a similar manner to that used in step 4, widen the hole slightly to accommodate the eyepiece. It should be about 1/4 inch deep.

This is what your piece should look like:



Now we need to turn the eyepiece and the keeper ring.

6. Mount your blank for eyepiece and keeper ring between centers, turn a tenon on one end and mount that end securely in your chuck. Put a 1/4 " bit in the Jacobs chuck and drill into the center of the blank. Turn the blank round, and reduce the end enough to snugly fit the eyepiece end of the

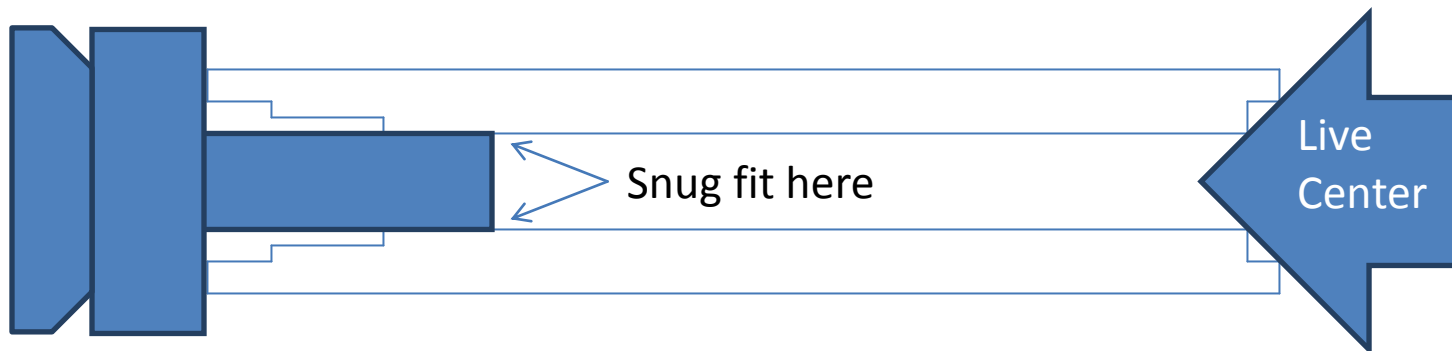
kaleidoscope over the tailpiece side of the blank to the depth of the eyepiece notch. Part off the eyepiece, a little bit longer than needed (no more than 1/2 inch) and put it aside.

7. Similarly, fit the cell end of the kaleidoscope over the remaining blank. Widen the hole to form a very thin keeper ring. Once again, part off the ring a little longer than needed.

8. Put the cell into the kaleidoscope, insert the keeper ring and sand the pieces even. Use a throwaway cell or protect the surface of the cell. On the eyepiece end, insert the eyepiece and sand the pieces even. Once again, put the eyepiece and keeper ring aside in a safe place.

It's finally time to turn the kaleidoscope round.

9. Make a pair of holders to fit into the drive end and tailpiece end of the lathe. The holder should fit snugly into the 1 inch hole of the kaleidoscope, and be long enough to extend past the cell enlargement. The other holder should be a cone to allow the hole of the blank to center on the midline of the lathe with no wobbling. See picture below.



Chuck End

10. Turn the kaleidoscope to your desired diameter. Finish on the lathe if you wish, but also remember to finish the eyepiece and keeper ring. We used 50/50 lacquer and thinner and buffed it all up.

Now let's talk about the innards. The lathe room is not the best place to assemble the finished product. It's too dusty, and the small pieces are likely to be lost in the shavings on the floor and work surfaces.

You have three choices for the mirrors. They should all be front side mirrors, also called first surface mirrors.

- Aluminum like the ones we started with from American Science and Surplus.
- Acrylic front side mirrors. You can cut these with scissors or rotary cutters if you are careful.
- Glass front surface mirrors.

11. The width of the mirrors should be .86 times the diameter of the hole, with an allowance for the thickness of the mirror. Since our hole was 1", I cut the mirrors just a smidge smaller than 3/4". ALWAYS ROUND DOWN. If your mirrors are loose in the kaleidoscope that can be fixed. But they must go in. This is another reason to use the acrylic mirrors. They can be trimmed down, but it is almost impossible to take off a sliver from glass mirrors that are too big.

11. Clean the inside of the kaleidoscope impeccably well. It should be surgically clean.

12. Assemble your mirrors using black electrician tape. It is somewhat flexible and easier to work with. But if it makes the mirrors too tight to get into the kaleidoscope hole, it can be replaced with thinner scotch tape. Don't remove the covering for the mirror until the last second and KEEP THE MIRROR CLEAN!

13. Assemble the cell. Fill it about 3/4 with pretty clear or translucent bits and beads.

14. Glue a clear shield on the back side of the eyepiece. In case the glass mirror breaks, you don't want glass to get into someone's eyes while they're enjoying the kaleidoscope. You also need it to keep the insides CLEAN. Glue the eyepiece into the kaleidoscope. Make sure you don't use too much glue. Don't drip any glue into the kaleidoscope. Remember, keep it CLEAN!

15. Insert the assembled mirror. Brace it in place with bits of foam to keep it from rattling. Make sure the mirror will be up against the cell. Insert the cell and carefully glue in the keeper ring.

Congratulations!

Resources

American Science and Surplus - sciplus.com -

Teleidoscopes with tin mirrors and acrylic balls. Often on sale.

Inventables - Inventables.com -

12 x 24" acrylic front surface mirror - \$46.20

Boston Craft Works - polymerclayprojects.com -

precut 1 1/4" x 8" strips - \$5

Glass front surface mirrors 16 x 24" - \$47.50

I have some excess glass mirrors and acrylic mirrors. Also some extra teleidoscopes from AS&S. Ask me for some before ordering for yourself.