CARVE A KALEIDOSCOPE
THE SNOWMAN

Before I became a kaleidoscope artist, I was a wood carver. After I had been making kaleidoscopes for a few years, the president of the wood carving club I belonged to asked if I could come up with a carving project that was a kaleidoscope that could be used by the members as Christmas gifts. I said I thought I could, but it would take me a while to develop it. I don't know how many years ago that was, but I thought it was time.

I'm planning on 3 projects. The first two projects are low to medium levels of difficulty to carve. The second project will be a simple chip carving. The third project will be a much more challenging carving project, but will once again have a beautiful kaleidoscopic image. All three projects will be Christmas oriented with a different kaleidoscopic image system.

This project is a snowman, which when you look under his hat you will see a kaleidoscopic mandala image containing a star which has 6 or 8 points. The bottom section of the snowman can be rotated, causing the image to change as it is viewed.

The project is divided into two parts; doing the carving and turning the carving into a kaleidoscope. I asked my mentor, Larry Nowell, who got me into wood carving, to carve some samples. His carving instructions and his notes are also included.

The thing about the carving is you can do whatever you want to do. You can basically leave it as the blank (a modern snowman), or totally carve the blank with any embellishments you want, and include carved adornments from your own woods, or adornments that are included in the kit. Here are some samples we came up with; your own creativity determines what your carving will become.

			
First Snowman	**Snowman With Stocking Cap and Pipe**	**Sam Stetson Snowman**	**Surfer Dude Snowman**

What's in the Project Kit

The kit contains just about everything you need to turn your carving into a kaleidoscope; however, you will need

1. epoxy to glue components together. You can try using E6000, but I have not tried it for this purpose. You will be gluing wood to metal and wood to plastic. Wax paper and several flat toothpicks have been included for mixing and applying which ever adhesive you use.
2. an Exacto knife with a new blade.
3. a cutting mat for working on (the green dollar store has some really inexpensive but good small cutting mats)
4. wire cutters for cutting head pins
5. white masking tape or scotch tape
6. canned air to blow out the mirror tube
7. Medium or fat Sharpie marker (not fine)

ASSEMBLING THE SNOWMAN KALEIDOSCOPE

Painting the Snowman – Special Considerations

The only painting criteria for your kaleidoscope is painting the **inside** of the eye lens holder (pipe under the hat) black. This will eliminate annoying light reflection. While this is not required, it is highly recommended.

After painting, you may want to spray your snowman with lacquer to make it glossier. If you do so, spray with light coats; if you use heavy coats the lacquer may make the paint run and cause issues. Do not get paint into the side of the holes where components will be assembled (i.e., bearing holes, object chamber hole, lens cap). The paint may prevent the bearings or other fittings from going together during assembly (tolerances are extremely tight). You will need to remove paint in the holes by sanding or scraping with your knife. The hole where the mirror tube will be inserted was sprayed with lacquer during production to reduce dust from the wood. You may want to sand these holes if you notice overspray in them. Test fit components after painting to identify issues and resolve them.

Adorning Your Snowman

Materials/tools you will need that were not provided with the kit: Wire cutters, epoxy or E6000 adhesive, any adornments you want to include.

Once your snowman has been painted, it is time to add any external adornments you want to use to enhance the carving. Your snowman comes with 2 different sized beads that are supposed to resemble coal that can be used as adornments. You may have created your own or may want to incorporate you own ideas. Now is your chance.

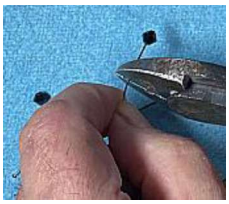
To attach beads to your snowman, it is insufficient to just glue them onto the body. While they may hold initially, eventually they probably will be knocked off. You need to use some method of gluing adornments **into** the wood, not just on the surface of the wood.

For this purpose, head-pins are present that allow you to string a bead, and then use the pin to be inserted into the wood. Note: The head on the pins is supposed to be larger than the hole in the bead. If it isn't, you will need to apply epoxy to the head before sliding the bead to the head. Let the epoxy cure before use. There are 3 considerations when attaching beads with head-pins.

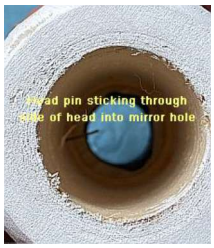
1. **Going through thin wood**

   The head is relatively thin compared to the middle or bottom ball of the snowman. Use the push-pin to create a hole where the head-pin will be inserted. If the push-pin goes through the wood, then life is good.

Thread the bead onto the head-pin, then cut the pin to the desired length.



If the pin went through the wood, leave the pin long, and just fold over the excess length inside the mirror hole and press down with a screwdriver. When the pin is bent, it cannot come out. You could also use epoxy or some other adhesive to hold the pin in place.



2. **Adorning Thick Wood**
   Unfortunately, my push-pin won't go through thicker wood. In this case you may have a brad from a brad-point nail gun that has a small diameter. An advantage here is that the brad is probably strong so you could use a hammer to drive it through the wood. Then you could attach the head-pin as before. You could also just use adhesive on the head-pin tail before it is inserted into the wood.
   A simpler method is to use a small brad point drill (e.g., 1/16") and drill a hole for the head pin tail to be glued into. If you have one, a twist drill bit and holder would have more small size options. Thread the bead, cut the pin to the length you drilled the hole, apply epoxy to the tail of the pin, and insert the tail into the hole. Because the hole will be larger than the wire, you must use adhesive on the wire before inserting into the hole.
3. **Adorning the Lens Cap**
   The carving blank is made from basswood which is very soft; however, the lens cap wood is Poplar which is pretty hard in comparison. While the push-pin can start a hole in Poplar, it can't go very far. You may want to try the brad trick, or use a small diameter drill bit to make a hole. You will definitely need to use adhesive if you add an external doo-dad to the lens cap. A large silver bead and silver head-pin is included as a "ball" for a stocking cap if you want to go that route.

Assembling the Mirror Tube

Materials/tools you will need that were not provided with the kit: Exacto knife, cutting mat white masking tape and/or scotch tape, canned air.

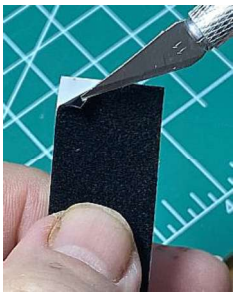
The mirror tube is the heart of the kaleidoscopic image creating the repeated reflections in the image. You will be making a tube of mirrors in the shape of an isosceles triangle. An isosceles triangle consists of two sides which are the same width, and a third side (the base) on which the

sides will sit on the edges. The base will be covered by a black material which will prevent light from reflecting on the base, resulting in a mandala image, which will be a star. This type of image is also known as a 2-mirror image. Your kaleidoscope image will have a mandala star of 6 or 8 points based on the mirror widths that came in your kit.

The outside of the box will be labeled indicating how many points are in the mirror system (e.g., 6pt), followed by a code which indicates to me how long the mirrors were. Mirrors were specifically cut to length to fit your snowman. The code indicates the color of mirror packet wrapper so I can verify the right mirror set has been included. Codes are: G=Gray, Y=Yellow, C=Cream.

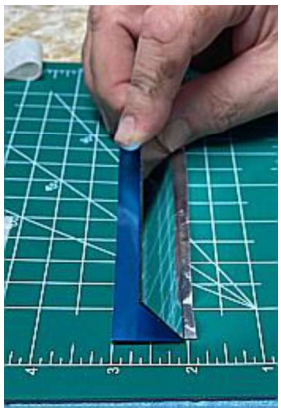
Open the mirror packet. It contains two side mirrors, the narrower base mirror, and the non-reflective black material (flocking) which will cover the base. **DO NOT REMOVE THE BLUE FILM ON THE SIDE MIRRORS UNTIL INSTRUCTED.** The blue film is protecting the "good" side of the mirrors which will go on the inside of the mirror tube.

1. **Remove the foil pieces from the kaleidoscope materials bag**. Note: The foil tape is incredibly sticky and will not come undone easily. There will be a long piece of foil mirror tape which will be used to wrap the mirror tube, which holds the mirror tube configuration, two small end foil tape which will be used on the edges of the mirror tube, and a narrow strip of foil tape which will be used to "hinge" the two mirror sides together at the top (apex) of the triangle. Make sure the "hinge" tape is the correct size (it may be too long). It should be about 1/8" shorter than the mirrors.
2. **Attach the black material to the base**. Peel the tape backing off the flocking and lay the black material onto the cutting mat with the flocking side down. Lay the base mirror centered onto the flocking's adhesive. Using an Exacto knife, trim off the excess flocking material.



3. **Use the narrow foil tape to "hinge" the side mirrors**.
    a. **Do not remove the blue film from the two side mirrors**
    b. Affix the foil tape 1/32" to 1/16" from one end of a mirror (on a shiny side), about half-way along the width of the foil tape and along the edge of the mirror. Spread the foil down the length of the mirror. If it's wonky, you can gently pull the foil up, and reposition it so it goes down evenly. It won't matter if there's some wrinkles in the foil or if the foil is not centered exactly across the two mirrors.

    c. Lay the mirror on the cutting mat, so the blue side is up and the foil is towards you. Take the other mirror, and hold it on the foil against the edge of the first mirror. Hold the 2nd mirror at an angle so it dangles over the first mirror (blue film is on the inside) then flip the 2nd mirror onto the cutting mat so the two mirrors are side by side, with just a narrow gap between the mirrors. You can "tug" on a mirror to stretch the gap slightly; making it uniform between the mirrors. Make sure the mirrors are well attached to the foil tape.

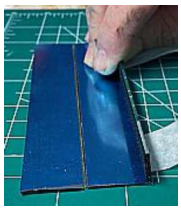


4. **Attaching the base mirror.**
    a. Cut 2 pieces of white masking or scotch tape 3" long.

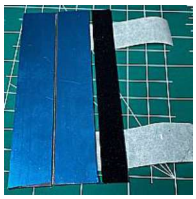
    b. Flip the mirrors over so the blue film is down (shiny side up). Attach the 2 pieces of masking tape about ¼" to 3/8" from the ends of a mirror and hanging down towards you.

    c. Flip the mirrors over so the blue film is up and the tape is towards you.

d. Place the edge of the base mirror on the masking tape, tightly against the mirror, at a 90-degree angle (base will be pointing up) and the flocking will face the blue film.



e. Flip the base mirror down onto the masking tape. Note the gap between the base mirror and the adjacent mirror will be wider than the gap between the two side mirrors. This is because of the angles you held the mirrors during assembly.



5. **Rolling the mirror tube.**
   a. Do a test fit.
   b. Make the mirror tube by folding the mirrors so the side mirrors are sitting on the black edges of the flocking. Just note any problems you have in making the tube, and what you need to do when making the tube

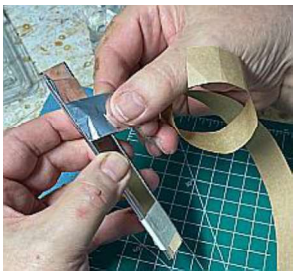
   c. You should have enough masking tape to close and hold the mirrors in a roll if desired. Unroll the mirror tube.
   d. Hold or lay the mirrors so the masking tape is pointing to the left. Remove the blue film on the far-right mirror by lightly stabbing the film with an Exacto knife, and pulling the film off. Pull the film towards you to remove it. If you pull the film up, you run the risk of breaking the mirror.

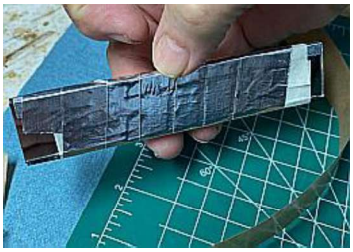
   e. Do this on the outer mirror, then the one next to it.
   f. After re-rolling the mirror tube, use the masking tape to hold the tube together.
6. **Adjust and set the mandala image**
   a. Look through the tube while holding a toothpick across the far end. You should see a 6-or 8-pointed star. If your star is not perfect (one of the arms is broken with two parts) you need to adjust the mirror.

   If you have less points than expected (e.g., 5.5 points) you need to squeeze the side mirrors along the base (flocked mirror) slightly to get a perfect star. If you have more points than expected (e.g., 6.5 points) you can widen the distance between the mirror sides by pulling on the mirror sides or pressing the apex down towards the base to make the bottom side angles wider. Adjust the mirrors as necessary to get perfect star legs.

b. Now you will wrap foil tape around the mirror tube to permanently keep the angles of the mirrors. The long mirror tube foil tape will be used to wrap the tube along a diagonal. You want each wrap of the foil to overlap the prior wrap. Unfortunately, getting the angle correct to do this can be tricky. To overcome this, you should do a dry fit wrap to determine the correct angle of the foil tape. Once you have figured it out, peel off a couple of inches of the foil backing from one end.

Place one end of the tape on the mirror at an angle, then wrap the mirrors with the foil tape, spiraling down the tube as you go (similar to a barber's pole).





You don't want to use a lot of pressure while wrapping the mirrors since this could cause the mirror angle to shift; ruining your perfect star.

c. You have two shorter pieces of the foil tape. Use these on the ends of the mirror tube, just wrapping the tape around the ends of the mirrors.

d. You should still have a perfect star once the tube has been wrapped. Try readjusting if necessary.

7. **Choose the eye-end of the mirror tube**
   a. Every mirror tube will have flaws, but you can try minimizing them by picking the best eye-end to look into the tube.
   b. Use your lens to look down the mirror tube to check the quality of your work. Sometimes you can mess up the mirror by grinding the mirrors together or you might get loose "stuff" stuck in the joints of the mirrors. If this happens, while looking through one end with the lens, one end looks better than the other (remember to use the lens when checking). The "better" side is the eye-end.

c. Choose the end you think looks best, and with a sharpie, mark the foil on the "eye" end.

d. Using the sharpie, blacken the edge of the eye-end of the mirror to prevent light reflection on the edge of the glass.

e. You can use some "canned air" to blow dust from the non-eye end toward the eye-end. Defects close to the eye are less likely to be seen, whereas flaws toward the far end will be more noticeable. Using a lens will cause your eye to focus more on the end of the mirror tube.

Be gentle using canned air! Use gentle puffs, don't blow a hurricane; too much air can dislodge the flocking which can get stuck in the apex angle as black bumps in your image. Don't shake the can; this can cause freezing of the can resulting in depositing frozen moisture vapor on the mirrors which will permanently fog the mirror.

8. **Attach the light blocking mirror foam to the mirror tube**
   a. At this point, if you inserted the mirror tube into the head section of the carving, then looked into the eye opening, you would be able to see both the inside and the outside of the mirror tube. Not a pretty sight.
   b. Black foam is provided to prevent users from looking down the outside of the mirror tube.
   c. Remove two of the triangulars foam pieces (extras are provided) from the kaleidoscope materials bag.
   d. Hold a piece of foam so the widest part is at the apex of the mirror tube. Use tape to affix the foam to the eye-end of the mirror tube. Attach the other foam piece similarly with the tape. The tape or the top and bottoms of the foam pieces will not be visible once the kaleidoscope has been assembled.

Assembling the Kaleidoscope

Materials/tools you will need that were not provided with the kit: 2-part epoxy, common nail with a wide head (optional), foam peanuts (optional).

I apologize; there are going to be a lot of small epoxy glue-ups. These need to be done in the order specified to make everything go together correctly. Remove the wax paper, tooth picks, bearing, and the bearing holder from the kaleidoscope materials bags.

When mixing epoxy, place the desired amount of the epoxy part A on the wax paper, then squeeze the same amount of part B over the part A (it doesn't matter which bottle you consider part A or B). Then mix with the two parts together using a toothpick. When mixing epoxy, go in a circle then pull from the edges of the circle to the center, then mix in a circle again. This should make a good mixture. You will then use the toothpick to apply the epoxy.

It doesn't take a lot of epoxy to do the job. Think of the epoxy volume you use in terms of the size of "peas". A small glue-up will be 1 "pea's" worth of epoxy. A larger glue-up may be 2 or 3 "peas".

1. **Attach the bearing to the bottom ball section**
    a. Place a bearing on a piece of wax paper. The wax paper/bearing should be on a flat hard surface.
    b. Take the bottom ball of the snowman and determine which hole fits over the bearing. Test fit the bearing into the hole. If it is too tight, see if there is paint in the hole. Sand or scrape the opening till the bearing will fit. You may need something to get the bearing out of the hole. When the bearing is inserted, there will be a gap between the bearing and the bottom of the hole. You can get something (a nail head) into this opening to pry the bearing out if it is too tight to remove.

    c. Once you've done a test fit, place a small amount of epoxy around the edge of the hole that will hold the bearing. The epoxy should only go along the outside edge (about 1/8" wide). Drop the bottom ball over the bearing and press it down until it contacts the surface the bearing is sitting on. You want the bearing and body to be on the same plane (flush across both). If you just press the ball onto the bearing they should be aligned correctly. Don't play with the bearing and accidentally push it deeper into the hole.

        As the bearing is pressed into place, the epoxy will scoot up the side of the bearing. If you have too much epoxy in the hole, the excess will settle onto the bearing top and make it difficult to turn. You will be able to get the bearing to turn, but it will always have a gritty feel to it. Just be careful with how much epoxy you use, and where you place it.

2. **Attach the bearing holder to the top ball section**
    a. Slide the mirror tube into the top ball section of the kaleidoscope (the foam should be leading) so the apex of the mirror tube is aligned with the nose of the snowman. The mirror tube should be inserted till the tube contacts the wood by the head.
    b. Find the bearing holder (the plastic circle). Notice there is a lip around the middle of the piece, and the lip splits the piece into two different sized halves. You are interested in the "longer" half for the first glue-up. Make sure the bearing holder will fit into the top ball section of the snowman. If it's too tight, determine why, and fix similarly as described for the bearing hole. Note: You will have to slide the bearing holder over the mirror tube to get it into position to be inserted into the wooden section. Note: Once the bearing holder is epoxied into the mirror hole, you will not be able to remove the mirror tube because the foam will not fit through the bearing holder.

    c. Mix up two peas worth of epoxy.
    d. Spread epoxy around the bottom edge of mirror hole in the top ball section. Slide the bearing holder over the mirrors and the epoxied edge into the top ball section the snowman. Note: Once the bearing holder is epoxied into the snowman, you will not be able to remove the mirror tube because the black foam pieces will not fit through the bearing holder opening.
    e. Make sure the mirror tube is inserted all the way into the head (and is still oriented with the nose).
    f. **Epoxy the mirror tube to the bearing holder.** Take some epoxy and spread it on the base mirror where it comes into contact with the bearing holder. This epoxy will hold the mirror in place within the mirror hole to the bearing holder. Note: If desired, before inserting the bearing holder, you could add some foam peanuts into the kaleidoscope body's mirror hole to help hold the mirror tube in place via compression. This is not necessary, but it would work in case the epoxy breaks at a later date.
    g. Stand the carving on its head to make sure the mirror tube rides on the wood inside the head, while keeping the mirror tube in contact with the bearing holder as the epoxy cures. You may want to use some additional objects butted up to the carving to make sure it cannot be knocked over while curing.
    h. Let the epoxy cure before continuing (I like at least double the listed time for the epoxy, so 5-minute epoxy should cure 10-15 minutes).

Joining the Snowman Sections

Materials/tools you will need that were not provided with the kit: 2-part epoxy,

1. Turn the bottom ball of the snowman so the bearing is on top.
2. Do a test fit. Drop the top section onto the bottom section. The small lip of the bearing holder should fit into the bearing in the bottom section. If you pick up the scope and look at the object holder, the mirror tube should be 1/16" to 1/8" less than where the object chamber will go. This will prevent the mirror tube scratching the object chamber as it is turned.
3. Mix up one peas worth of epoxy.
4. Spread epoxy on the bottom side of the bearing holder.
5. Slip the top section of the kaleidoscope onto the bottom section. The short edge of the bearing holder should fit into the bearing. Try standing the snowman on its lens holder while the epoxy cures (this will prevent excess epoxy running into the bearing).

Finishing the Kaleidoscope

Materials/tools you will need that were not provided with the kit: 2-part epoxy, tweezers, alcohol or eye-cleaning liquid, canned air

This is your last chance to make sure everything is good. Since we haven't sealed the kaleidoscope, it is possible to still blow air into the mirror tube from the object chamber end towards the head. Spin the bottom section of the snowman to make sure the epoxy did not get into the bearing.

1. Place the object chamber of the table with the black side down and the clear side up. Make sure the plastic is clean.
2. Get out the lens using tweezers to avoid handling it with greasy fingers. Make sure it is clean, and if necessary, clean the lens with alcohol or eye-cleaning liquid, using canned air to blow away any fibers you left during the cleaning process.
3. Mix up two peas worth of epoxy (you'll be doing two glue ups)
4. On the bottom ball of the carving, spread epoxy along the bottom area and the edge where the carving will sit on the object chamber. Keep the epoxy more on the outside along the edge of the hole bored for the object chamber.
5. Set the carving onto the object chamber, so the clear top edge of the object chamber fits into hole bored into the base of the carving.

6. Spread a small amount of epoxy around the inside lip of the lens holder. Just a small thin amount of epoxy is necessary on the lip (not the side of the lens holder).
7. Using tweezers, drop the lens onto the lip where you just applied the epoxy. Use a toothpick to make sure the lens is seated well. If you must use your fingers, make sure you are only touching the outside edge of the lens.

8. Let the epoxy cure.
9. If you get epoxy on the outside of the lens, wait until the epoxy has cured, then use your knife tip to scrape the epoxy from the lens.
10. Try out your kaleidoscope. With one hand, hold the scope by the body to your eye, and with the other hand turn the bottom ball section. You do not have to hold the black end toward a light. The light enters through the clear sides of the object chamber not through the black end. Make sure your hand is not covering the clear object chamber (and blocking the light from entering the scope).

While viewing your kaleidoscope, say the kaleidoscope mantra "oohh, aahh". Congratulations, you have become an official carved kaleidoscope artist!