http://homepage.mac.com/nephilim/imagineerieing/magic_mirror.html

How-To: The Magic Mirror

Mirror, Mirror, on the Wall
Who's the spookiest one of all?

The Magic Mirror illusion is our signature effect here at Carnival of Souls. It debuted at our 2003 haunt, and has been a huge hit with the trick-or-treater's ever since. Kids love this effect.

This is an advanced project which takes a lot of work and a lot of planning (and a fair amount of cash), but nothing in this project is very difficult as long as you think ahead and work safely. Extra helpers who know how to paint, woodwork, or just move around sheets of MDF and shelving units, will be helpful, too.

As always, lest you wind up a victim of your own magic mirror's machinations, take safety precautions when making any halloween project.

Note: These instructions have been updated based on our experiences building haunt props since 2003. Some photos may not match our recommendations for building.

The Idea

The idea is to create a magic mirror prop that will interact with your visitors, similar to the magic mirror from the Classic Disney film Snow White (or the more recent Shrek series), but of course, you could use whatever visage you like.
To make the mirror more interactive, we will place the mirror on the wall above a dried-out lion's head fountain. A blast of smoke will spew out of the lion's mouth into the basin, and when the smoke clears, the treats for the children remain in the basin.

To accomplish this illusion, we will build a wood-and-foam facade, attached to a metal shelving unit for support. A fog machine will provide the blast of smoke, and a hidden hole in the wall will provide access for placing candy in the basin. A computer screen will furnish the face of the mirror (although in a pinch, a human face or puppet could easily be used as well).

A 'scrim' will be used to obscure all but the face from the trick-or-treaters. (A 'scrim' is a piece of semi-transparent fabric that is opaque when illuminated from the front, and transparent when illuminated from behind. We found appropriate material at the local fabric store for less than $3 per yard.)

The best way to envision this is to see the one we built in action. The first part of the clip shows what it actually looked like under normal light conditions. The rest of the clip consists of sample interactions with trick-or-treaters shot with 'night-vision' due to the low light conditions. (Unfortunately, the night-vision reveals the outline of the computer monitor, but this was not visible to the visitors.)

This video shows the first couple of trick-or-treaters we encountered, so the puppeteering is a little unpracticed. However, at the end of the clip, it demonstrates a fun way to stall for time while you're waiting for the fog machine to warm up again. (The little girl ended up singing 'Twinkle Twinkle Little Star' for the mirror, which was a crowd pleaser for everyone in line.)

**Materials**

To make the Magic Mirror, you will need:

**Expendables**

- two quarter-inch 4’ x 8’ sheets of MDF
- three 4’ x 8’ sheets of pink insulation foam (sold at Home Depot and other hardware stores)
- seven 8’ lengths of 2’ x 2’ (try to get them as straight as possible)
- a metal shelving unit
- plenty of machine screws, wood screws, and nails
- four hinges
- two yards of 'scrim' fabric
- 2 rolls of carpet tape
- 1 gallon of medium-gray latex paint
- 1 quart black latex paint
- 1 quart white latex paint

**Tools**

- Drill
- Jigsaw
- Screwdrivers
- Cheap Foam Cutter (the small cardboard tube with a wire)
- Wood burner pen
- A fog machine
- (optional) karaoke machine or other speech effects device
- (optional) a computer and one of:
  - (optional) the free version of the Magic Mirror (downloadable below)
  - (optional) one of the digital puppets from ImaginEERIEing
- (optional) ...or a mask, puppet, or other way to
The Magic Mirror: Design

Designing your Facade

The first thing to do is sketch out on paper the design you want your facade to have. We went with a centerpiece 4' x 8' facade with two 2' x 8" "wings" on either side. Our sample centerpiece design can be seen at right, but you should of course come up with your own design, since your shelving unit may not be the same as ours.

We recommend starting your design by measuring where the shelves in your shelving unit are (unless you plan on building a custom shelving unit to your design). That way, you know where your mirror's face will appear, where you can place supports, and where it is feasible for your puppeteer to sit and operate.

We also recommend that you spend some time in the location where you will be displaying the facade. We discovered that a facade that is six feet tall would be ideal, and that a four foot wide facade with two 'wings' of two feet each would give enough room for a puppeteer if it were placed in a corner and each wing folding back slightly to touch each wall.

Although doing it all on paper would be fine, we are more comfortable using a computer program to do our design work. We brought our measurements into Adobe Flash (any vector-drawing program will do) to do the actual design work. Try to consider where everything will be placed and how it will be attached. Be sure to read below about how we placed the lion's head and the basin. Make sure to work at a consistent scale as you design.
Transferring your Design onto the Materials

The next step is to transfer your design onto the materials. To do this, we printed out our design at a scale of one inch to one foot. We then drew a half-inch square grid on our plan using a ruler and pencil, and a half-foot square grid on the foam and MDF using a marker or chalk line. (The marker is easier, but the chalk line has is less likely to leave visible lines.)

Note: In the photos below, you will see that we used the white one-inch foam. We no longer recommend that you use this foam. We now use the quarter-inch, denser pink foam available from Home Depot and other outlets. The difference is that the quarter-inch foam is much sturdier than the one-inch "pebbly" foam. In our original design, we had to harden the foam using watered-down Durham's Water Putty, but with the sturdier pink foam, this is no longer necessary (unless you want the stonier texture).

Once you have both gridded off, you can transfer your design onto the foam and MDF by sketching in each square.

We ended up transferring the design onto two piece of MDF. The first one held the center panel, four feet wide. The second one held both of the side panels, each two feet wide.

In our design, we used multiple layers to give the facade depth. The mirror's frame and the lion's head were going to be raised, so we used another piece of foam for these details. (Since these were going to be cut out and attached to the base layer of foam, we could place these close together to save foam, as seen in the photo below.)
The Magic Mirror: Framing

Building the support panels

Our design only calls for our facade to be six feet tall, so the first thing to do after transferring the design is to use the jigsaw to cut the top of the MDF pieces to the right height. Be sure to take all the proper safety precautions such as wearing safety glasses and being careful around the blades.

We then cut the second piece of MDF down the middle to create the two 'wings'.

Cut the 2'x2' strips to fit the edges of the support panels and screw them in using the wood screws. This yields the three panels that will form the support structure for our facade, with support beams and a place to screw the hinges into. In our design, we didn't need crossbars for the center piece, since the shelving unit would provide the support, but we cut crossbars for the top and bottom of the wings (not shown in picture).
Step Four: Build the facade exterior

The next step is to work the foam into the textured exterior of the facade. Melting foam releases dangerous fumes, so be sure to work in a well-ventilated area, and wear a safety mask.

Use the foam cutter to cut out the foam shapes you need. We found that you don't have to be perfect in this, since we're going for a rough-hewn stone look anyway.

Once you have the foam cut out, detail it with the wood burner. If you have enough detail in your pattern, this is largely just a matter of sketching over the pattern again with the wood burner. I liked to add a crack in the stone here and there to give it an aged look.

The lion's head was built out of two layers of foam: one for the head and mane, and one for the snout to give it a little depth. We didn't want the trick-or-treaters looking directly into the tube we were going to use to pipe the fog into the mouth, so we added two spacer layers of foam behind that to give the fog a path to travel from the hole in the facade, down a short corridor, and out the mouth:

We shaped the lion's snout using the foam cutter so it wasn't just a block.

At this point, you can also build the basin. We used three layers of foam, one cut to be the bottom of the basin, and the other two layered on as the border of the basin. (For the bottom of the basin, we could conveniently use the oval piece of foam we cut out to leave a hole for the mirror.)
Note that for the basin's bottom, we have a complete ellipse, not just half of one. This way, we can slide the 'flat' half into a slot in the facade, set it on a shelf of the shelving unit, and weigh it down to give it some real rigidity. This is because this is the one piece of the facade we expect kids to touch. We actually went so far as to cut a piece of MDF to fit the bottom of the basin so it would be very sturdy - again, we could conveniently use the oval piece of MDF left over from the hole for the mirror.

Once the basin was constructed, it was a simple matter to use the foam cutter to smooth the layered edges, and then use the wood burner to made a stonework pattern in the resultant form.

**The Magic Mirror: Detailing**

*Before you detail the foam, you may decide that you need to strengthen the foam a bit before proceeding. If you couldn't find the stronger pink foam we mentioned earlier, and are using the more fragile white beaded styrofoam, you'll probably want to do this step. If you managed to use the pink foam, you probably don't need to do this and can continue on to "Painting the Foam" below.*

**Strengthening the Foam (optional)**

Since we want the foam to withstand being moved around and touched by trick-or-treaters, we want to strengthen it a bit. To do this, you can use Durham's Water Putty like paint to paint on a strengthening layer to the foam.

Mix the Water Putty with water until you get a consistency about like Latex paint, then generously brush it onto the foam. Work with small batches of putty, since the putty dries very quickly.

The putty can then be used at a thicker consistency to give it a stonier texture, or to build in a little transition between layers of foam.

When it dries, the foam becomes stiffer and sturdier.
Be sure to wait for the putty to dry before trying to paint it.

**Painting the Foam**

Now it's time to paint your facade. This is the fun part! **Only use latex paint on the foam!** Other paints may dissolve all your hard work!

We recommend experimenting with different painting techniques on some scrap pieces of foam before starting on your facade.

Cover all your foam with the base color. We used a mismixed batch of gray we got at the local Home Depot on the cheap, but you could use any stony color from a slate blue to a sandstone tan to a marbled green. (The Water Putty makes it a nice sandstone color naturally, but I'd still recommend giving it a base coat, just to protect it from anything that might get spilled on it.)

Once that has dried, you can start brushing in the stone detail. Start with the deep grooves. We brushed a deep black into the grooves and a watery black along the edges of the bricks, using a paper towel to pull out unwanted color when necessary. Put more black at the bottom side of bricks than the top, to suggest shadows.

Then paint a faint wash of black over some of the bricks to give them some variety. You can also use varying washes of black to visually push some bricks back in relation to the others.

Once that's dry, you can either dry-brush some white highlights onto the foam or do a watery white wash in places for a different feel.
Paint all your foam pieces. Try to use a consistent method throughout so that all the stone matches. You may find that it helps to have the same one or two people do all the painting for this reason.

**Assembling the Facade**

Finally, it's time to assemble your facade! You might want to move everything to the final display location if you can, since it will be awkward to move from now on.

If you haven't already, now is the time to cut out the holes for the mirror face, the fog conduit, and the slot for the basin.

Bolt the center piece onto the shelving unit. To do this, put the center piece up against the shelving unit, and use a pencil to mark on the MDF where the holes should be drilled. Drill the holes, and use the machine screws with some washers to bolt the MDF to the shelving unit.

Duct tape the scrim fabric over the mirror hole. Make sure that there are no wrinkles in the fabric, or else they will show up as lines across the mask's face. We ended up having to iron our fabric to get the creases out - 'wrinkle releaser' type products did not work well enough to remove the crease.

Attach the hinges to the 2' x 2' support beams so that the sides can be angled back. This will allow you to put your facade flush against the wall, but still move the wall enough to allow easy access to the back room.
Use the carpet tape to attach the foam onto the MDF. Use generous amounts of tape to get a secure bond. Be careful when pressing the foam facade onto the MDF - you don't want your handprint in the stone!

Attach the lion's head with more carpet tape. Slide the basin assembly into the slot so that the interior part lies on the ledge of the shelving unit, and weigh it down so that it is sturdy, and your facade is done!

**Optional Features**

You may find that you want more detail than just what paint and foam can provide. There are many creative things you can do to add some spooky ambiance to your mirror facade:

- Buy some plastic vines and attach them to the facade, to give it some life.
- Add hooks to the side panels to hold flame lights for an eerie, medieval look. Drill a hole in the facade so that the power cord isn't visible from the front.
- Add something to hide the hinged areas where the side panels are attached. You could paint cardboard tubes with the same paint to make it look like columns, or you could cut strips of foam to look like corner stones.

**The Magic Mirror: Haunting**

Your facade is now done. It's time to generate the actual effect. To accomplish the final effect, you need to provide some sort of puppet or actor, and carefully control your lighting.
Lighting the Effect

In order for the scrim to work properly, there needs to be a lot more light in front of your facade than behind it. You want as little light behind the facade as possible. Set up your lighting situation to achieve this. You may need to drape a blanket or black plastic over the top and back of the facade if you have lights shining down into the back area.

Remember, also, that your visitors will need to be able to see where they are going, so this works to your advantage - light the front of the facade with some fairly bright, creepy light, such as some flame lights, or spooky blue and red light. So long as you have a lot more light in front than behind, the scrim should work.

Generating the Fog

Place a fog machine on the shelf of the shelving unit closest to the lion's mouth. Position the duct so that it will direct the fog out through the lion's mouth when it blasts, and make sure the fog machine's control are placed in a location where the puppeteer can easily active it.

You will want to leave yourself some time to figure out the best way to control the fog. Experimentation will help you get the best effect here, because fog can be finicky.

If you want that drifting-down fog look, you can also use a "fog chiller." Basically, if you chill the fog over ice before pushing it out the lion's mouth, it will fall and pool in the basin a bit, which is an eerie effect. There are plenty of plans on the web for building fog chillers - we built our own using an old ice chest and running ducting to a hole in it, then out the far side towards the lion's mouth.

The Mirror Itself

We have several digital puppets that you can use for your effect. If you're on a tight budget, our original puppet from 2003 is available as a free download, but it has all the warts and pimples of a hacked-together-moments-before-Halloween prop (it's the same one we used for five years at our own haunt). Otherwise, you can pick up one of the more user-friendly, polished puppets for $15.
If you don't like the digital puppets, a simple and cheap method is to just use a flashlight on your own face to create the effect. With some eerie makeup and black clothes, you could provide a convincing mask that would have far more expressive power than a digital puppet. (Be sure to plan in some breaks for your puppeteer because this can wear out your actor fast.)

Alternatively, you could create a puppet using styrofoam, card stock, or whatever else you have handy. The only thing the visitors will see through the scrim is whatever you have lit behind the scrim, so with a little experimentation with materials and lights, you should be able to come up with something entertaining.

**Audio**

Finally, for audio, we used a borrowed karaoke machine that would amplify our voice and add an echo effect. You could use anything similar to boost your voice, such as a microphone and amplifier.

You don't necessarily need to amplify your voice, but it gives presence to your effect, and if it gets noisy, it will be difficult to hear your puppeteer's voice behind the facade if you don't amplify it. We recommend that you do.

You might be tempted to use one of the voice changer boxes that go on sale around Halloween. We've found that they're more trouble than they're worth. Most of them distort your voice so much that it is often difficult to make out what you are even saying, let alone allowing you to carry out a coherent conversation with a visitor. Work on your voice acting a bit, rather than relying on a gimmick, and you'll deliver a performance much better than what the voice box could give you.

Who dares stand before the Magic Mirror?
Mirror was the digital puppet that started it all. Introduced in 2004 at the Carnival of Souls yard haunt, the Magic Mirror was a huge hit with the kids, causing our visitors to more than double the following year through word of mouth. (And we've been growing steadily every year since.)

Features

- FREE!
- Three modes of control: Keyboard, Microphone Input, or Performance Playback.
- Customizable key settings. You can define which keys cause which effects.
- The many moods of the Magic Mirror: asleep, sad, docile, and furious.
- Surly teens coming to your door without costumes? Show the "No Costume, No Candy" sign!

If you use Mirror at your home haunt this year, be sure to tell us about it and we'll feature it on our "Friends of ImaginEERIEing" page!

What I ask of you

You may use this digital puppet freely for your own haunts, with the following conditions:

1. Please don't redistribute this program. Instead, link to the original page at:
2. Send me a link to a photo or, preferably, a link to a QuickTime movie of it in use at your haunt, and tell me how it worked out for you! I'd love to hear your stories. Send links to nephilim at mac dot com.
3. The Magic Mirror may be used freely for home haunts. If you want to use the magic mirror for a commercial haunt, please contact me. I'd be happy to work out a deal with you which would probably consist of free admission to your haunt (if I'm within easy travelling distance) or some video footage (if I'm not), and a credit somewhere in your haunt.

How to control the Mirror

The Magic Mirror is designed to be run with your monitor set to 640x480 resolution. At this size, it will fill your monitor screen. For maximum effect, set the Mirror to "portrait" mode, and turn your monitor on its side.
In its default configuration, these keys control the Magic Mirror:

- **A**: Change to "asleep" face
- **S**: Change to "solemn" face
- **D**: Change to "angry" face
- **F**: Change to "happy" face

**Option or Alt**  Open the mouth (will stay open as long as you hold it down)

- **N**: Display 'No costume No candy' sign

**Using your microphone to control the Mirror**

You can also use your microphone or other audio input to control the mouth motion of the Magic Mirror. To do this, follow the directions below to turn on 'microphone_input' and set the 'microphone_sensitivity'. Once you have these set, re-launch the Magic Mirror, and speak into your microphone (or play your CD, or whatever - use your standard OS controls to determine the sound input). The mirror should move his mouth to the audio.

Often, the microphone sensitivity needs adjustment. You can call up a console to dynamically adjust the sensitivity on-site. In the default configuration, these controls are used to interact with the microphone console:

- **\**: Toggle display of the microphone console.
- **[** Lower the volume threshold where the Mirror opens his mouth.
- **]** Raise the volume threshold where the Mirror opens his mouth.

The console displays the current volume input level, and the threshold you've currently defined. By adjusting this while testing your audio, you should be able to get to a point where the mouth stays closed except when you're talking.

**Note:** It is not recommended to use the Mirror in this fashion, but this feature was added by popular demand. The volume waveform generally does not map cleanly onto how you'd want the Mirror mouth to open, and that's before you deal with ambient noise (from, say, excited trick-or-treaters!) or phonemes like "mmmm" which produce sound but would not
normally cause the mouth to open. Be sure to experiment with manual control before settling on microphone control - you get much better results with manual control.

If you do decide to use microphone control, here are some tricks you can use to maximize the performance of your Mirror when using microphone input:

- Use the console each time you launch your Mirror, and re-calibrate if the noise level at your attraction changes.
- Set the threshold just barely above where the ambient noise sits. Have someone emulate trick-or-treater noise nearby to ensure that the mouth doesn’t start opening when the kids talk.
- Speak in long, emphatic tones, and avoid "hmm"s and "ooo"s.
- Do everything you can to dampen extraneous noise. Use a headset microphone so that your voice is very close to the microphone - the further away it is, the closer your voice will be to ambient noise, and therefore, the more likely you'll get false mouth openings and closings.
- Practice! Practice! Practice! Especially if you're going to be in a position where you cannot see the puppet.

Customizing the Mirror

When you first run the Magic Mirror, it will create a preferences file called "MAG_MIR.TXT" for you in the same directory as the Magic Mirror. By editing this text file, you can customize how the mirror works.

You should be able to edit the file with any text editor, as long as it can save back into raw text format (in particular, don't save it as Microsoft Word!). Quit the Magic Mirror before editing it. For the most part, the options are either explained or are self-explanatory.

The simplest things to do is to change the control keys to ones which are more convenient for your own use. For instance, suppose you wanted to control the Magic Mirror's mouth with the Shift key instead of the Option key (Windows users will want to turn off Sticky Keys if they do this). All you need to do is open the preferences file, change "key_open_mouth option" to "key_open_mouth shift", save the file, and launch the Magic Mirror again.

You can also change the orientation of the Magic Mirror on the screen between "portrait" and "landscape". "Landscape" is the default behavior. "Portrait" gives you a larger mask face, but requires you to turn your monitor on its side.

Automating the Mirror

You can also "train" your Mirror to do performances without a puppeteer. This will take some experimentation and patience on your part, but I tried to make it pretty easy.

The first thing you need is a sound file for the Mirror to work against. It needs to be in a file format that QuickTime understands. Place it in the same folder as the Magic Mirror, and edit the preferences file to set the "audiofile" option to the name of the file you just put in there. Be sure
to include the three-letter file extension (Windows users may have to right-click the file and look at the properties to see it).

This defines an audio file that the Mirror will load in when it starts up. Once it is loading correctly, it can be used to automate your performance.

To record a performance, edit the preferences file, and choose keys for the "key_record_sequence" and "key_play_sequence" keys.

In the Magic Mirror program, press the key you defined to record a sequence, and the audio file will begin playing. Act out the performance with the keys as if it were a live performance. At the end of the sound file, it will automatically save your performance (replacing any performance that was previously saved).

You can view your performance using the key you defined to play a sequence. If you decide to manually trigger your performance, you can stop now, and just trigger your saved performance with that key. (It's a good idea to go back and redefine the record sequence key to "none" so you don't accidentally save over your performance.)

However, if you want to leave the Mirror unattended, go back and edit the preference file again once you have your performance recorded. Change the "unattended" option to a number greater than -1. (A value of -1 is normal operation, and any other number is "unattended" mode.) The next time you launch the Magic Mirror, it will automatically play the sound file over and over again, waiting a number of seconds in between equal to the number you entered for the "unattended" option. (In other words, if you changed "unattended" to five, it would wait five seconds before playing the audio file again.)

System Requirements

The Magic Mirror has only been tested on a snow iMac (256MB, 500MHz PowerPC G3, RAGE 128 Pro). Your mileage may vary, but it should run fine on any newer Mac or PC. The software is provided as-is. Use it at your own risk. If the Magic Mirror banishes the only copy of your dissertation to the shadownet, well, that's what you get for dabbling with dark powers, occult artifacts, and untested software all at the same time.

Version History

v2.2

Emergency Halloween release attempting to correct a control bug a fellow home haunter was experiencing. (Unknown whether this release solved the problem.)

v2.0

Added requested features like microphone input and scene recording.
That's it! You're ready to haunt your home with a creepy magic mirror that will interact with the local trick-or-treater's. Here are some parting thoughts to help you get the most out of your experience.

- It's fun playing the part of the Magic Mirror, but you will probably want to take a break at some point, if only to see your visitors' reactions to the mirror. (You can see your visitors through the scrim, but it's hazy. You'll want to interact a bit with your guests on the night of.) Plan on having some relief puppeteers for the big night if you can.
- While our puppets have the ability to let you record a performance and loop it in playback mode, resist the urge to use this and let it just run by itself all night. The real magic of this prop is the fact that it interacts with the kids and can have a conversation with them.
- Our puppets also have the ability to drive the mouth based on microphone input instead of controlling it manually with the keyboard. The feature was added by popular demand, but we highly recommend you don't use it. You get much better results by manually controlling the puppet, especially if your haunt gets noisy (since loud noises nearby could then open the mouth). It doesn't take much practice to internalize the mouth control to match it to your speaking, and it produces a much more believable performance.
- If you can, pair your Magic Mirror actor with an usher. If you don't have a line waiting to see your Mirror the first year, you will definitely have one the second year. An usher can help keep the crowd back to give each kid the one-on-one time with the Mirror that makes it so magical,
and can relay responses more loudly for you when you have the occasional shy child who won’t speak up. He can hold off the crowd while you refill your fog machine, help you stock up on candy if you run low, and generally act as a greeter for your neighbors and friends. And if anything goes wrong with the mirror, such as an unexpected alert from your operating system or something, the usher can alert you instantly, and deal with the crowd while you get it fixed.

- Speaking of unexpected alerts, be sure to turn off all applications running on your machine for best performance. Check your calendar, anti-virus, backup, and other auto-running applications to make sure that you don’t get reminders or other dialog boxes popping up during your performance.
- Set your monitor to 800x600 and use the portrait mode of the software to create the largest mirror face.
- Go easy on the fog blasts. Use only the shortest blast you need to get the effect across. Since the heated plate cools off when fog juice hits it, and your machine will eventually shut off while it reheats the plate occasionally, the shorter bursts of fog you use, the more you’ll get between reheat cycles.
- Have some “stalling” techniques in mind for when your fog machine has to re-heat its plate. Sometimes your fog machine may take a little while to warm up and be ready for fogging. One effective technique we’ve used is to withhold the candy until the person in front of the mirror sings a song. Whether it’s a cute little kid that sings a cute song, or a teenager who has to grudgingly sing “I’m a Little Teapot,” it’s a crowd-pleaser either way, and is sure to kill enough time to get the fog machine up and running.
- If you find that your fog machine stalls out too often to be workable, you can always have two behind your facade, and switch between them. Have two ducts, one attached to each, so that your puppeteer only has to connect the one in use to the lion’s head.
We hope you've enjoyed this article on the Magic Mirror. It's a big hit with the kids on our street every year, and it has delighted kids (and adults) of all ages. That's really what Halloween is about: providing a fun, spooky experience for kids to add a little magic back into their lives. When you consider that, all the work to get this thing made was well, well worth it.

Happy haunting from the *Carnival of Souls* crew!