The Beginners Guide To Sculpting Miniature Figures From Scratch

Drew Williams Sculpting Studio

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Special Gen Con Seminar

FIGURE SPECIALISTS FOR TOY, GAME, AND HOBBY INDUSTRIES

An independent developer and designer of figurative sculptures for various toy and game companies as well as private collectors the world over.

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# Table of Contents

The Purpose of this Booklet ..............................................................2
Advanced Materials .........................................................................2
Making a Curing Oven .....................................................................3
Making a Rig ..................................................................................4
Making an Armature .......................................................................5
Classic Laws of Anatomy .............................................................7
Laws of Miniature Anatomy ..........................................................9
Posing the Armature .....................................................................9
Under–Anatomy ...........................................................................10
Super–Anatomy ...........................................................................11
The Human Head & Face .............................................................11
The Hands ....................................................................................12
The Feet ......................................................................................13
Further Advanced Materials .......................................................13
Suggested Resources .....................................................................14
Suggested Suppliers ......................................................................14
Appendix: Image Resources .........................................................15
The Purpose of this Booklet

The purpose of this booklet is to provide the experienced miniatures hobbyist with the foundation to begin in original miniature fabrication in the same manner as many of the professionals do. Additional years of training and observation, as well as experimentation in tools and materials use is recommended to make full use of the techniques and principles outlined in this Booklet. However this will hopefully provide a solid 'first step' in the right direction.

Advanced Materials

copper wire (stripped doorbell wire will do)
Jewelry wire clippers
small flat (no teeth) needle nosed pliers
solder (light duty, low temp, rosin core, with a % silver best)
Dremel tool (or other multi-speed precision rotary device)
micro drill bits and various dental drill bits
various needles mounted to handles
large clay sculpting tools
jewelers coping saw
supply of fresh no. 11 hobby knives blades
unused bottle corks
alligator clips
larger clamps
reliable super glue
heavy plasticard (thickest scrap found at any sign maker shop)
measuring device with exact metric (rulers or calipers)
assorted fine grit sandpaper
texture collection (open cell foam scraps, coarse sandpaper, etc)
table vice
freezer
reliable oven or other heating device
Making a Curing Oven

A curing oven is not a required tool, but it makes your sculpting life a little bit easier. You can use a regular oven to cure your pieces, but it ties up your kitchen, wastes energy, and drives up your utility bill needlessly. Not to mention you probably don’t sculpt in your kitchen, and a home made curing oven can sit right next to you while you work.

Materials Needed:
1 Large Coffee Can (Maxwell House ‘Flavor Seal’)
Cloth or Electrical Tape
1 Small Photographer’s Flood Light that matches the cans diameter.
1 Low watt bulb (40 watts is fine)

Step 1–Door: Cut out a square on the side of the can. This will become the door to the oven. Be very careful not to hurt yourself on the sharp edges.

Step 2–Insulation: Cover the can and the sharp edges of the opening with cloth tape. Also tape the outer side of the metal square you cut out and replace it with a tape ‘hinge’ to make a door. Be sure to tape all over the edges thoroughly, as you hand will be going back and forth here a lot. You can also add a folded piece of tape at the end to act as a handle and also hold the door closed while curing pieces inside.

Step 3–Heat Element: Remove the clamp from the flood light. Rest the lamp on top and turn it on. Viola! Your own personal curing oven. Be sure to use low watt bulbs, though. Otherwise it could get too hot inside and might cause the epoxy to boil and blister.
Making a Rig

In combination with sculpting a flat tab to the feet of your sculpture, a rig will help you keep your fingers clear of your fresh work while also providing good grip with the least obstruction to the underside of the piece. Rigs are fairly easy to make, and they are a reusable piece of equipment, so it’s definitely worth the effort.

Materials Needed:
1 cork stopper (available at your local winery or arts & crafts store)
2 alligator clips (check your local Radio Shack or hardware store)
approx. 4”–6” of lightweight aluminum tubing (local model hobby shop)
1 drill or dremel tool with matching diameter bit to aluminum piping
1 jewelry wire cutter (or heavy duty wire cutter)
1 or 2 metal washers slightly larger in diameter to the cork stopper
Epoxy, Super Glue
Needle Nose Pliers

Step 1: Cut 2 equal lengths of aluminum tubing at approx. 2” (Use the needle nose pliers to restore the cut ends to their original shape.).

Step 2: Drill 2 holes straight down into the cork towards the center, but approx. 1/2” apart.

Step 3: Dab some super glue into the holes and stick the 2 tubes in. It is important to keep them parallel to each other, and at the same height. After the glue sets you can reinforce them with some epoxy at the base. Glue the washers onto the bottom to add a bottom weight to the rig. Bake the epoxy to make it sturdy before moving on to step 4.

Step 4: Insert the 2 alligator clips into the tops of the tubes, bend the metal on the clips as necessary to make them fit. Be certain they are positioned parallel to one another! If they are not square with each other, the rig won’t hold your piece right, and cause it to pop out while you are sculpting. It might be necessary to rely on careful dabs of super glue to set the proper position first. After the glue has dried the clips in their proper alignment, you must reinforce them with epoxy, shoving it down into the tops of the tubes and around the clips at the tubes.

There you have it! You can also do a few at a time, this will save you some effort and time if you plan on juggling several pieces at a time.
Making an Armature

There are many ways to make armatures, but what you’ll see here mostly is my personal approach. I use solder on my wire armatures, as I find it is the most durable and stable. Many other sculptors use putty at the cross points. You may not have a soldering iron on hand (or want to bother), but you should read over this section anyway, as there are a lot of things that apply to any armature creation. The following instructions are good for a human armature, scale up to 30mm. If you want to go bigger, you can increase these measurements accordingly.

Materials Needed:
Soldering Iron, wire, ruler, wire clippers, pliers, sharp hobby knife, cork board, thumb tacks, light duty solder

Step 1:
Cut the bare stripped copper wire into 3 pieces. The longest being for the legs (6”), the second longest for the arms(4”), and the shortest for the torso connecting them (2”).

Step 2:
Next you’ll may want to agitate the surface of the wire with your blade in the cross areas. This will help make a tighter bond with the solder.

Step 3:
Pin the wires down to the cork board like this, with the 2” being the torso wire, the 4” the arms, and the 6” the legs and tab.

Step 4:
Measure the distance between the arms and legs along the torso wire. The distance you’ll want is depended upon what scale, sex, and style you’re going for.

Step 5:
When soldering, you should apply the hot iron as shown, touching both wires where they cross. Once both wires are thoroughly heated, bring the rosin core solder to the opposite side of the cross, letting it melt into the joint.
Step 6: You'll want to make sure the cross joint is well-soldered. You should have solder touching all the wire's sides. Try to avoid getting huge blobs of solder, though.

Step 7: After you pull the armature off the board, take your wire cutter and snip off the excess torso wire at the crotch. Get as close as you can, but be careful not to break up the soldered joint.

Step 8: To make the head, take your needle nose pliers and loop the head wire. Be sure to leave a neck, then snip off the excess wire. When using the pliers, be careful not to pinch the wire. This can create weak points that can and snap.

Step 9: Make careful measurements as you move onto bending the joints. At such small scales, a variation as much as a couple of millimeters can distort a figure's anatomy terribly.

Step 10: Bend the rest of the limbs. Loop the leg wires at the feet and then bend sharply downward. You may want to use the extra wire on the arms for weapons or cut it off at the hands. The additional wire on the legs is used to create a stable base or tab. If you create a tab with the wire, You should bend the wire into the shape of a rectangle, with the top of the rectangle connecting just 2 to 3 millimeters below the feet.
Classic Laws of Anatomy

Much about the fine arts approach to figure sculpting is disposable when regarding mini sculpture for gaming. However, this little glimpse into some of the higher principles of rendering the human form could turn what would be a good miniature into a great miniature.

Lines of Movement: An active pose will invariably feature an invisible Line of Movement. This is a fancy name for a very simple principle. Locate the two parts of the body most distant from each other in any pose. This could be a hand and a foot, the head and a foot, in extreme poses even both hands or both feet. Then imagine an unbroken 'line' flowing through the form between the two points. If the pose is a good one your imaginary line should have an elegant curve and 'flow' as it follows its route through the body. Exaggerating the pose to enhance this single elegant curve in the form is how you make use of this principle. Example: A figure stands with her right hand holding a sword above her head, and her left leg extended as she leans to her right. The Line of movement in this pose is probably from the sword down to the left foot. With some added exaggeration to the pose that makes the invisible curves of the Line of Movement more appealing to the eye, the whole figure can seem more dynamic and yet elegant.

Lines of Contrast: At the same time you imagine and reinforce the Line of Movement in your figure, you are also given the opportunity to exploit the human forms natural disposition to counter-balance itself. As we move, we normally shift our limbs, shoulders, and hips in opposition to each other in order to maintain balance. So if one hip is raised slightly, the shoulder on the same side will slope downward an equal number of degrees to help compensate the shift in weight. By extension, if an arm is held forward and up, it is likely that the other arm might be held to the rear and low. Further, if a figures left hip is moved up as well as forward, it can be visually poetic if the left shoulder is both moved down as well as back.
Plumb: If our body is left standing in place, our head will always be found positioned directly above the foot set to take the majority of our body's weight for that moment. As we walk, we naturally move our feet to constantly maintain this relationship. There are only three instances when our feet are not in this relationship to our heads. 1) When we are in the middle of jumping, mid-stride, or some other 'transitional' pose. 2) When we are braced to receive an unknown burden, so we may quickly adjust to the correct foot once the new weight is known. 3) And when we are off balanced and falling.

When making a figure, decide if the activity is one of these Four. If it is a well balanced stance or walk, draw an imaginary 'plumb' line directly down from the center of the head. The weight bearing foot should be located directly below this imaginary 'plumb' line. If the desired pose is 'transitional' (ie: mid-stride running) you might want to consider choosing a foot and favoring it over the other, since models made in perfect mid-stride usually don't look comfortable to the viewer. If the pose is off balanced, then it must be a 'defeated' figure you are sculpting. If it is 'braced' then it would be important to do what you can to visually explain why the figure is braced.
Laws of Miniature Anatomy

The fact that your sculpture is meant to be smaller than your thumb makes certain principles of mini-sculpting handy. Viewing a figure in such a scale is actually quite interpretive, since proportions must be exaggerated to make the piece visible to begin with. Consider the fact that if a human being could be shrunk down to 28 millimeters in height, she would probably have wrists and ankles as slender as a hair.

Head height should probably be a bit generous. Normally large scale figure sculptors prefer to proportion their pieces at 7.5 to 8 heads in height. Naturally many people range around 7.5 heads. For a miniature that would make the face so tiny no details could really be seen, and the form would seem more like a 'pinhead'. It is generally best to keep to 6 to 7 heads proportion for miniatures.

Another thing you will want to avoid in most instances is posing the figure with both knees bent. This may sound obscure and unnatural, as we all know that there are many natural poses where both knees are typically bent, but in 28 millimeter scale this posture often translates to the viewer as seeming very uncomfortable or even quite lewd. Sometimes a sculptor can get away with it, but be forewarned and take care if you should try.

Axis: If you hope to have your figure cast you must check with your mold makers for their requirements for casting correctly. Your figures pose may be limited by the casting process.

Pour: Your caster should be able to advise you on whether your figures pose presents any problems in terms of casting. Certain poses may prove too difficult.

Posing the Armature

The best tool for choosing a pose for your miniature is your own body, not someone else's illustration of a body. Whenever choosing a pose or gesture, view yourself in a mirror to see what it might look like, and stretch your body to the extreme of that pose to get a feel for what parts of the body are working the most. Decide in exact terms, what your creation will be doing. Take the time to role play the desired personality if it helps. Decide upon an action, and move that action to its most extreme gesture. The exaggeration is often necessary to convey the intent of the gesture over the smallness of the scale.

Example: A figure is preparing to wrestle with a beast barehanded. This person should be posed in a 'braced' stance, ready to take on whatever is thrown at him. The exaggeration is to spread the feet apart as wide and evenly as possible, to lean the shoulders and neck far forward in readiness for an impact, and to open the palms of the hands dramatically so the personality seems ready to receive and grapple.

The wire bending itself must be taken very carefully, since any mistakes you make will affect the entire sculpture.
Under–Anatomy

The first layer can sometimes seem the most difficult, as you adhere the putty to the bare wire. A helpful tip to ease this phase is to clean the wire with a good dip and light scrub in water and dishwashing liquid. This will remove any layer of industry residue or body oils that would make the wire slick. Another tip would be to gently agitate the surface of the wire with sandpaper in order to give it a rougher surface.

Begin with a very fresh mix of putty. Especially when working with the popular 'Green Stuff'. Adhesiveness is key at this stage, and most putty is at its most adhesive when freshly mixed. You might experience trouble with the putty sticking to your fingers more than the wire. This can be cured with a very small tap of saliva or Vaseline on the fingertips, but be careful not to let this lubricant touch the surface of the wire. Add only enough putty to coat the wire. At the start, do not try to create anything more than a very skinny putty skeleton. If you are able to build up the shape of the ribcage, etc. at this stage, go for it. But if you wait until the first layer is cured that is perfectly reasonable.

The ribcage, pelvis, skull, and knees are the main distinguishable elements of the under–anatomy. It is not expected to be resolved in every detail, but the overall shape and size of these parts must be done with some precision. Skipping this stage and moving on to the general mass of the form is possible, but the sculpting is more likely to go awry without the anatomical reference of the skeleton beneath as a guide.

Other layers of the under–anatomy that can be added after the 'skeleton' has dried are the masses of muscle on the inner thighs, the shoulder blades, the jawbone, and the mass defining the organs under the ribcage. Again detail is not required, but the shapes must be well considered.

Here is the development of my “Berber Chieftain” from skinny putty skeleton, to muscle definition, and final product.
Super–Anatomy

Most of the super–anatomy is about the muscles of the body, and a beginner should have plenty of reference material on hand for this part, whether it be sketches by Da Vinci or just someone else’s sculpture. Most instruction about the muscles of the human body would be too detailed for the frame of this booklet. But these basic standards can help you along the way.

Most muscles have an end that is tapered and an end that is relatively thicker and bunched. The thick end is often referred to as the 'head' of that particular muscle. Locating the 'head' of any muscle you are concentrating on can be important in finding realistic definition.

Muscles of the human body overlap each other in different directions (like on the shoulders), and some muscles start at a mutual location and then fan out (like the chest). Practice your chosen pose and feel the muscles of your own body as you move around, to get a feel for which parts are working harder than others.

Be open to using the work of other artists to inform your decisions, but be wary of how accurate that art is. Comic book art is a great source of inspiration, but the artists who created that art often referred to more classical sources for their core information. Creating a piece of art derivative of another piece of art can sometimes lead to a degradation in quality, much as does a photograph of a photograph, or an audio recording of an audio recording.

Example: The 'head' of the biceps muscle is closer to the shoulder than to the elbow.

The Human Head & Face

The human head is only one third face, mounted upon the front end of an egg shaped skull. Observation is your greatest tool. Look in the mirror, you have a head (at least you should!) Pay close attention to where the spine connects to the skull, as this can make a head look freakishly wrong if it’s off by much. Because the face is of such focus when we look at people, the tendency is to exaggerate it’s size in comparison to the rest of the head. This is a mistake. The face and head are intrinsically part of each other, and a change in their relationship is immediately recognizable.
It is possible to do the face in 2 stages. The first stage is to sculpt the brow, the basic form of the nose, the cheeks, and the jaw line leading from the middle of the sides to the point of the chin. Leave empty spaces for the mouth area and eyes. After you’ve let this shape cure, go back and add small dabs of putty for the eyes, rest of the nose, and mouth. Faces are very subtle, and you’ll need plenty of practice. For practice, study another figure that has a good face, and try to emulate the results.

Here are some basic guidelines to keep in mind.

a) The eyes are in the middle of the face.  
b) The nose ends halfway between the eyes and the chin.  
c) The mouth is halfway between the end of the nose and the chin.  
d) The cheekbones come to a point below the outer corners of the eyes.  
e) The corners of the mouth are below the center of the eyes.  
f) The top of the ears line up with the top of the eyes.  
g) The bottom of the ears line up with the nostrils.  
h) The top of the forehead is domed but the lower part directly above the brow is cylindrical.  
i) The temple shapes above the brow carefully.  
j) The sides of the skull are flat behind the temple.

The Hands

Follow this diagram of the hand to the right. All the knuckles fan out in an arc, radiating from the wrist. Be certain not to make the fingers the same length, and remember to taper them to the ends, to avoid the dreaded “sausage” hands. Sometimes you may find it useful to sculpt the thumb after the fingers and palm are dried. When doing so, practice with your own thumb, to understand the thumb’s range of rotation and angle of grip. When sculpting the hand around objects, remember it takes 3 points to get an effective grip. There is the thumb against the fingers, and there is also the base of the palm. Without the mass in the base of the palm, we wouldn’t be able to grip very well. If you sculpt a hand gripping a prop without all 3 points, the hand’s action will look improbable.
The Feet

The feet are unique and specific in their form and function, with little variation from person to person. The clearest approach to understanding the form of the foot, is to understand the essence of its function architecturally. Much as a roman arch distributes weight efficiently off to the sides, the arch of the foot transfers the weight efficiently to the heel, the ball, the outer ridge, and the big toe evenly. When both feet are planted together, a hollow center is formed. As anyone who understands architecture, this makes for a very efficient means of bearing a lot of weight on a small point.

When sculpting the foot, one of the first things you’ll want to sculpt is the inside arch of the foot, and as you do that sculpt the top of the arch as it descends into the toes. The most prominent is the big toe and the knuckle just above it, determining which way the foot is pointing. Do not forget the outside edge of the foot, or the heel. Without these we would simply fall over, and you don’t want your figure to do that.

Further Advanced Materials

Provide yourself with a suitable workbench with plenty of spaces to store your small tools and supplies when not in use. A level surface is best, and if it is at all possible. A medium-sized mirror within a glance from your seated position can be surprisingly indispensable as well.

A workbench and comfortable environment will do very little good without the inclusion of superior lighting. Multiple swing arm lamps should be mounted toward both sides of the table as well as in the middle and above. Though some florescent lighting will do, at least a couple of angles should be lit with bright incandescent and even halogen lamps (though the halogen lamps could cause some extra heat and must be positioned at a distance). You should ultimately have between three to five direct and ambient sources of light positioned to illuminate as many facets of your work as possible.

The last element for a productive studio setting is proper seating. A chair that will be used for hours on end must be well cushioned and supportive. For the extra investment, there are special chairs available to order, that are specifically designed for such work. They are typically swivel based, often with wheels, and often have no back or arm rests. They’re designed to redistribute the weight of your body off of your lower spine. A more important factor than this however, is the relaxed position of the arms and head in relationship to the surface of the table to be worked on. Poor body position while working can result in discomfort and even physical damage. This can make elevation adjustability the most important factor in choosing your seat. Consult your chiropractor or physician for medical advice on this subject. I’ve had my best results by positioning my seat so my table edge is a couple inches above my elbow level.
Suggested Resources

These books have all proved to be invaluable to my work. Dover books in particular are very affordable.

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<tr>
<th>Suggested Resources</th>
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<tbody>
<tr>
<td><strong>Modeling and Sculpting the Human Figure</strong></td>
<td><strong>Modeling and Painting Figures</strong></td>
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<tr>
<td>by Lanteri  <strong>Dover</strong></td>
<td>by Scutts  <strong>Osprey</strong></td>
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<td><strong>Dynamic Anatomy</strong></td>
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<tr>
<td>by Hogarth  <strong>Watson–Guptill</strong></td>
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<tr>
<td><strong>Dynamic Wrinkles and Drapery</strong></td>
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<tr>
<td>by Hogarth  <strong>Watson–Guptill</strong></td>
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<tr>
<td><strong>An Atlas of Anatomy for Artists</strong></td>
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<tr>
<td>by Schider  <strong>Dover</strong></td>
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<td><strong>Modeling the Figure in Clay</strong></td>
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<tr>
<td>by Lucchesi  <strong>Watson–Guptill</strong></td>
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Suggested Suppliers

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<tr>
<th>Micro Mark Supplies</th>
<th>Micro–Tools</th>
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<tbody>
<tr>
<td>340 Synder Avenue</td>
<td>P.O. Box 6505</td>
</tr>
<tr>
<td>Berkeley Heights, NJ 07922–1595</td>
<td>1236 Callen St. Suite A</td>
</tr>
<tr>
<td>Phone: 908–464–2984</td>
<td>Vacaville, CA 95696–6505</td>
</tr>
<tr>
<td>Fax: 908–665–9383</td>
<td>1–800–359–2878</td>
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<tr>
<th>Perfect Touch</th>
<th>Aves Studio</th>
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<tr>
<td>Another micro tool dealer</td>
<td>The makers of a variety of sculpting epoxies</td>
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<tr>
<td>P. O. Box 905</td>
<td>P.O Box 344</td>
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<tr>
<td>Sugar Land TX 77487–0905</td>
<td>River Falls, WI 54022</td>
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<tr>
<td>281–980–6498</td>
<td>1–800–261–2837</td>
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<tr>
<th>Fortress Figures</th>
<th>PolymERIC Systems, Inc.</th>
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<tr>
<td>Some very good casters</td>
<td>The makers of the legendary “Green Stuff”</td>
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<tr>
<td>P.O. Box 66</td>
<td>723 Wheatland St.</td>
</tr>
<tr>
<td>Jonesboro, IN 46938</td>
<td>Phoenixville, PA 19460–3394</td>
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<tr>
<td>phone: 765–677–9388</td>
<td>1–800–228–5548</td>
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<tr>
<td><a href="http://www.fortressfigures.com">http://www.fortressfigures.com</a></td>
<td><a href="http://www.polymeric.com">http://www.polymeric.com</a></td>
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<tr>
<th>East Valley Supply</th>
<th>Ebay</th>
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<tr>
<td>Another epoxy maker worth checking out</td>
<td>Search “Dental Tools” and you can dig up some great deals! I recently got a box of over a hundred tools for $20</td>
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<tr>
<td>4635 East Valley Road</td>
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<tr>
<td>Andover, New York 14806</td>
<td><a href="http://www.ebay.com">http://www.ebay.com</a></td>
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<tr>
<td>(607) 478–8178</td>
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<td><a href="http://www.gapoxio.com/">http://www.gapoxio.com</a></td>
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Appendix: Image Resources

Bhorgese
For More Information, Please Call or Write Us At:

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