

*Q. Larouche*



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## TEXTILE CONSERVATION NEWSLETTER

# Intersecting Silhouette Mannequins

BY DENIS LAROUCHE

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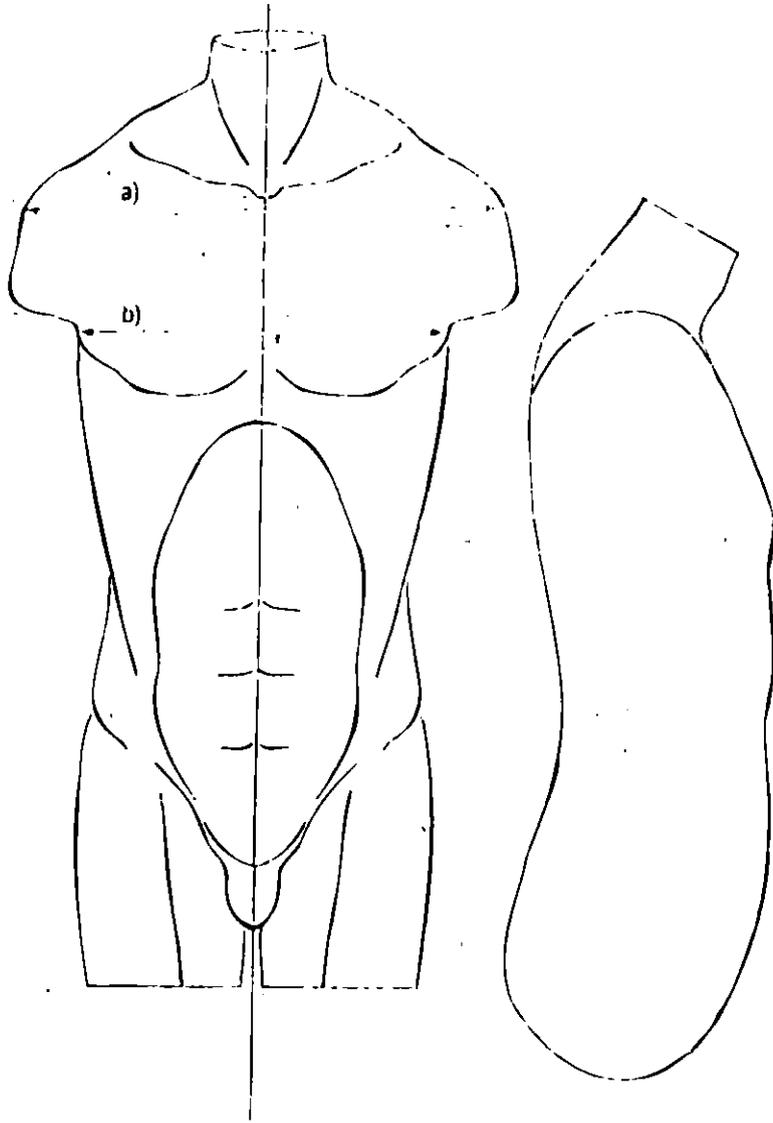
A simple technique for making natural looking  
mannequins out of ethafoam.

*Ce texte est également publié en version français.*

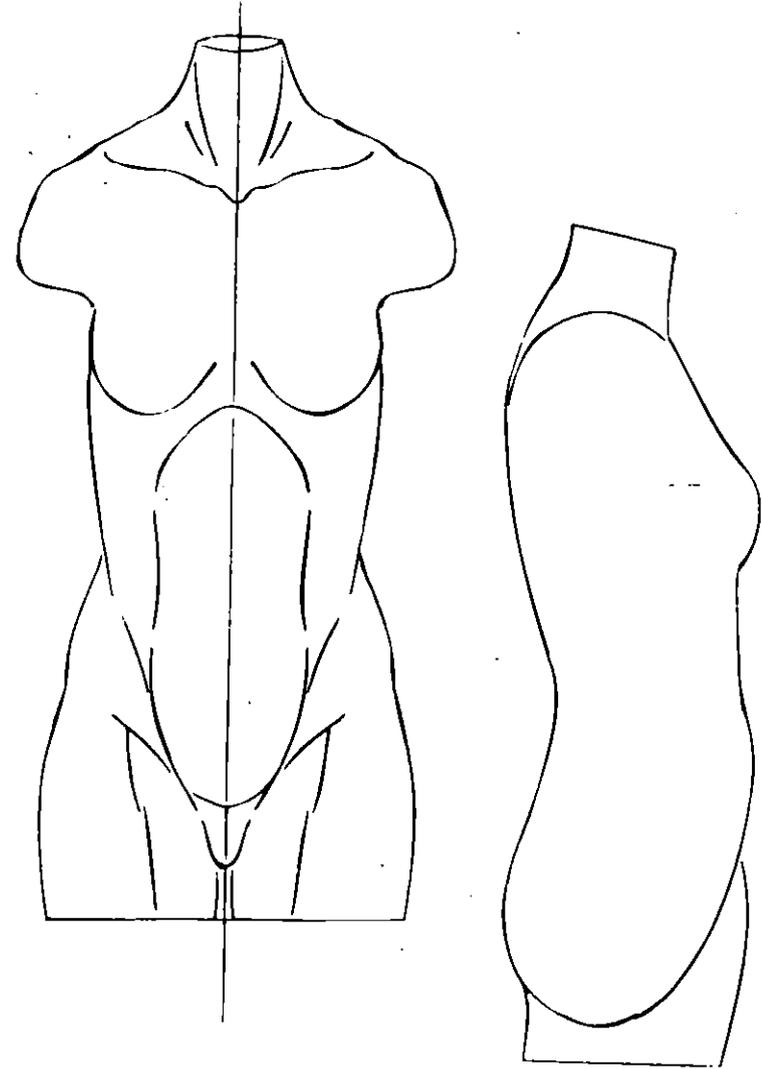
# About The Author

Mr. Denis Larouche is a graduate of the Museology Program at Algonquin College, Ottawa, Ontario and The Ontario College of Art, Toronto, Ontario. He is a display artist and model-maker at The Canadian Museum of Civilization.

*Thanks to Renée and Helen*



Adult male mannequin, frontal view and profile



Adult female mannequin, frontal view and profile

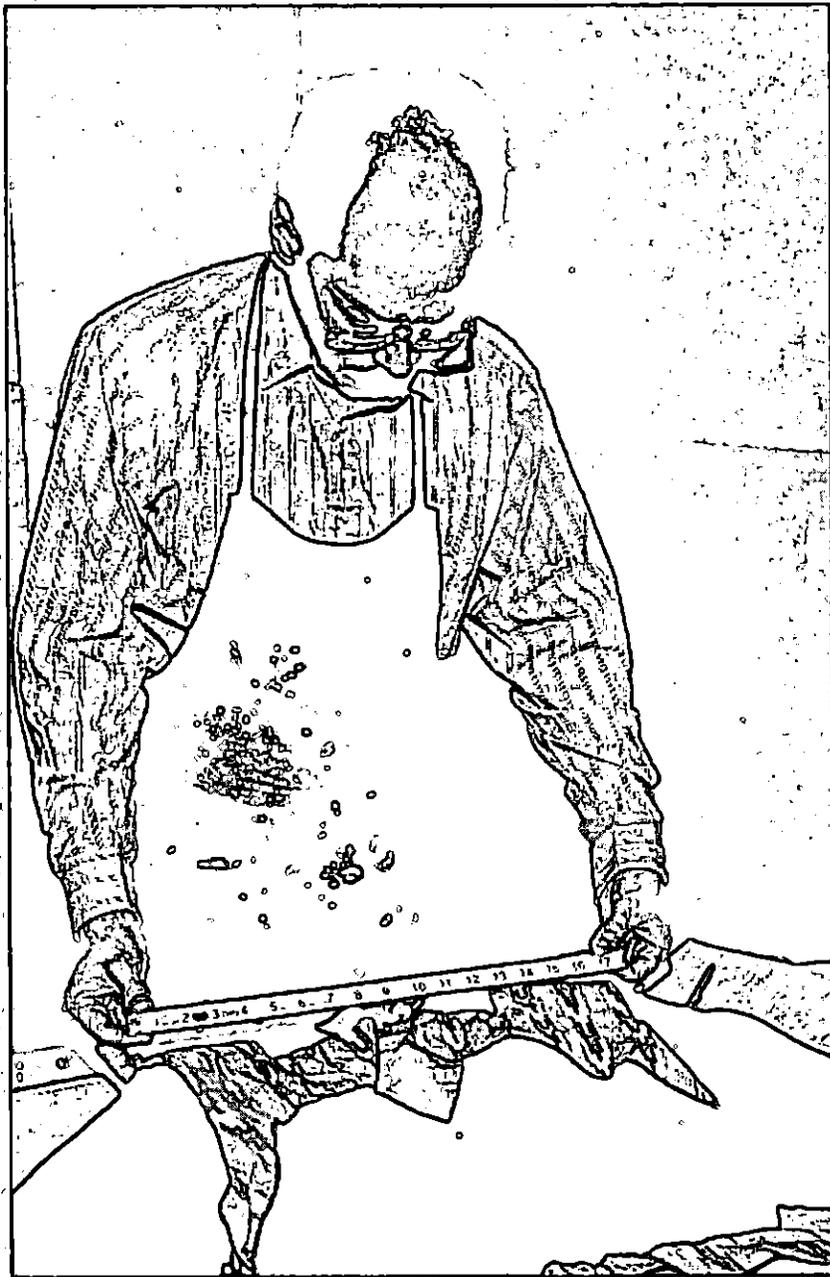


Photo: 1

## **INTERSECTING SILHOUETTE MANNEQUINS**

A simple technique for making natural looking mannequins out of ethafoam.

### **MANNEQUINS MADE TO MEASURE**

In the spring of 1994, the workshops of the Canadian Museum of Civilization in Hull, were involved in the preparations for a major exhibition "Threads of the Land," on the theme of native clothing. In addition to preparing scenery for dioramas and theme-oriented murals, the involvement of the exhibition and technical services workshops also included constructing approximately 140 full and half-figure mannequins for the display of parkas, anoraks and other similar garments. Since these mannequins were to be used mainly as props for artifacts, it was important that their dimensions correspond to those of the garments. Also, because of the large number of artifacts, it was necessary to develop a faster, more systematic production technique than usual. Finally, all materials selected to fabricate these mannequins had to meet conservation standards in terms of stability and compatibility with the artifacts. Those materials therefore, had to be chemically stable as well as safe and easy to use.

### **CALCULATING THE MANNEQUIN'S PROPORTIONS BASED ON THE DIMENSIONS OF THE GARMENT**

Since each mannequin is made to measure for a given article of clothing, it is important to establish a relation between the two. Many articles of Eskimo, Inuit, Déné, and other clothing, though very well made, are cut without patterns or precise measurements and the shoulders, sometimes seamless, are often quite rounded. The measurements of the original owner may therefore be very difficult to determine. The mannequin's approximate dimensions can however, be calculated based on the dimensions of the garment itself.

The shoulder width is generally the most reliable reference (see diagram 1, line a). If the article is of "European" cut, a straight measurement can be taken at the shoulder seams (photo 1). The article is first laid out flat, then about 3.5 cm ( 1½") is subtracted from the shoulder width. This gives a mannequin of very acceptable dimensions. The same applies to any anorak made of a material that shows the shape of the shoulders. It is not necessary

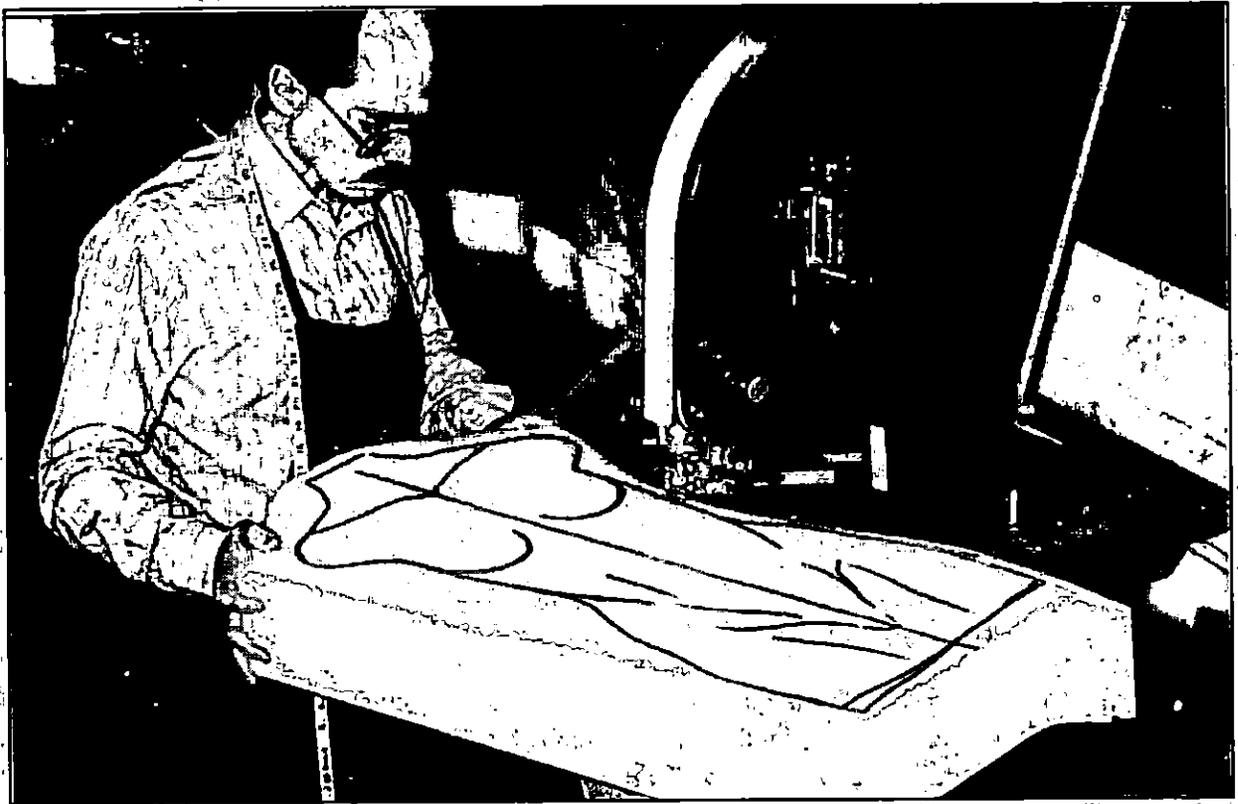


Photo: 2, 3

to remove much from the width of the shoulders of the garment because the shape of the body at that point is a very elongated ellipse, barely shorter than the width of the garment laid flat. This measurement was not so much calculated as decided upon after numerous tests on several garments. It simply seems to work well.

However, should this shape not be discernible, a different approach may be used. The article is first spread out quite flat and its width is measured just under the arms (diagram 1, line b). Using the equation **dia.=circ.** " (remember your geometry?), it is possible to calculate the circumference of the garment and from there, the width of the torso of the mannequin. This is equivalent to about 61 percent of the width of the garment. For instance, let us look at a parka measuring 59.5 cm ( 23 1/2") under the arms. The circumference of the garment would be 59.5 cm X 2 which is 119 cm ( 23 1/2" X 2 which is 47"). This divided by " (3.1416) is 37.8 cm (14.9"), which is the diameter of a circle with a 59.5 cm. ( 47") circumference. The ratio between the width of the garment at the armpits, 59.5 cm ( 23 1/2") and the width of the mannequin at the same place, 37.8 cm (14.9"), is about 63%. Taking into account a half inch layer of padding added all around the foam shape, you get a ratio of 61%. One could argue here that the shape of the body is not really circular, but the difference is rather small and for the purpose at hand, it can be easily overlooked. So we now have:

$$\text{width of the mannequin} = \frac{\text{width of the garment} \times 2}{3.1416}$$

When using this method however, it must be kept in mind that because the clothing is handmade, adjustments to the form will most likely have to be made.

## FABRICATION

Once the size of the mannequin has been calculated the actual fabrication begins. Using an overhead projector the face-on and profile silhouettes of the mannequin to be cut out are projected onto a 4-inch thick sheet of polyethylene foam (photo 2). The measurement used for reference will be either the width of the shoulders of the garment, less 3.5 cm ( 1 1/2"), or the width of the body just under the arms, as calculated above. That example had given us a width of 37.8 cm. ( 14.9"). The desired dimensions can quickly be obtained on the frontal silhouette by moving the projector back and forth. The two silhouettes outlined can then be cut out using a bandsaw (photo 3).

These silhouettes are the key to this technique of making mannequins. A first view, face on, shows the main parts of the body and the shape of the shoulders, waist, hips, and so on. A second view, in profile, gives the line of the neck and back, defines the small of the back, the chest and the shape of

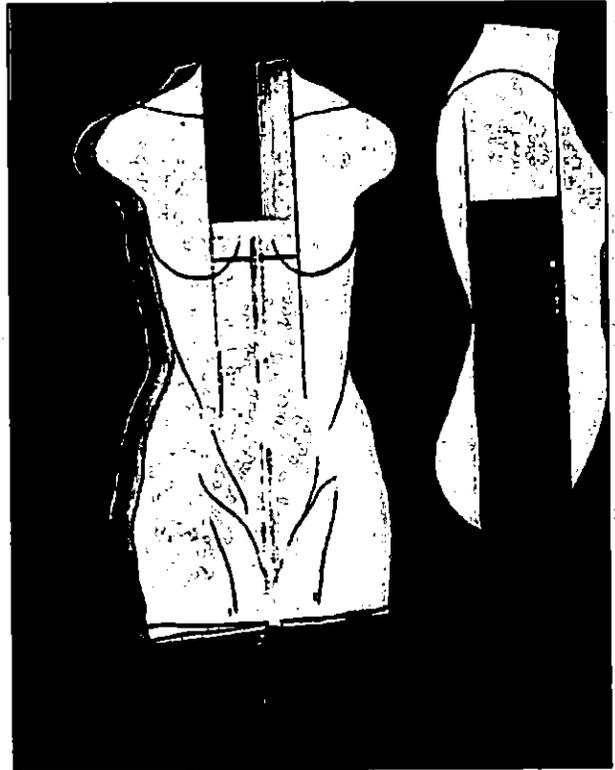


Photo: 4, 5, 6

the belly (see diagram 1). It is important that both silhouettes are drawn together on the same acetate and to the same scale, so as to avoid moving the projector once you have reached the desired dimensions. Otherwise, the proportions of the two silhouettes would no longer match.

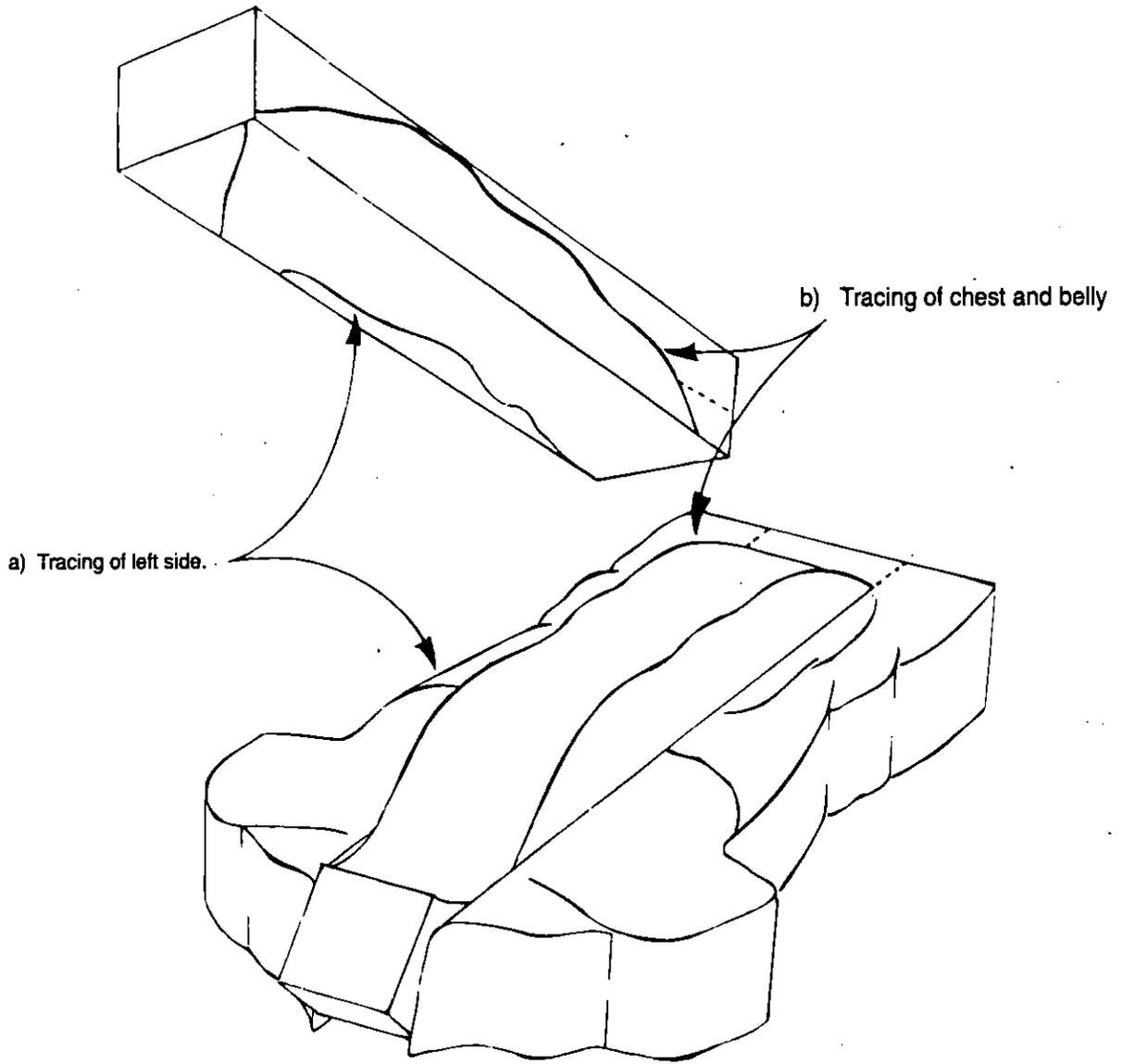
While the initial body shapes can be taken from an anatomy text or by tracing the contours of a friend, they can eventually be supplemented with all sorts of variants (large man, child, pregnant woman, etc.) and become a useful reference for an institution that has sizeable collections of clothing.

Once cut out the two silhouettes (front and profile) are slotted so that they fit together vertically at a 90-degree angle. For those who know Montréal, think of Place Ville-Marie. The width of the slot is, of course, the same as the thickness of the sheet of foam. A thin strip of wood or a piece of cardboard cut at the right width helps to rapidly block out the areas to be cut out (photo 4). On the face-on silhouette this slot extends from the neck to the middle of the chest. On the profile it rises from the crotch to meet the other slot in the middle of the chest (photo 5).

It is very important before cutting these slots that the two pieces be properly lined up using several reference points, such as the throat, the point of the breasts and the navel. They must be at the same level on both pieces and the profile silhouette must fit exactly at the shoulders. This means the shoulders should be neither too far forward nor too far back in relation to the neck. As the chest naturally protrudes more than the back, the axis of the shoulders should not be directly in line with the middle of the neck, but set back slightly. This alignment may seem obvious but can be easily overlooked.

If the mannequin is to be mounted on a metal rod a groove can be cut in the middle of the face-on silhouette (before attaching the side view figure) with a router or saw. The two pieces are now ready to be glued together. A hot-glue gun does the job very well.

We now have a three-dimensional shape whose proportions are adapted to the garment it will "wear" (photo 6). The next step is to cut all of the edges, except for the breasts on female mannequins, at an angle of about 20 or 30 degrees. This is because in sculpting a round or oval body from a rectangular block the corners will have to be shaved. You don't have to cut that much off here. You are merely initiating a curve around the body. Cutting the line of the collarbone at this same angle will help define the shape of the shoulders and bring out the neck and throat. Other pieces can then be added in the mannequin's reflex angles, that is, the spaces between the two figures. These can be cut from any straight edged piece such as offcuts from the board or sections removed to assemble the two silhouettes together. A piece is laid (not glued yet!) into one of the reflex angles and the adjacent edges traced onto it. The excess material can then be trimmed off with the band saw. For instance, to fill in the front/left angle, a piece of ethafoam is put into that section. The curve of the chest and belly and the contour of the left side are traced onto it and the piece cut (See diagram 2).



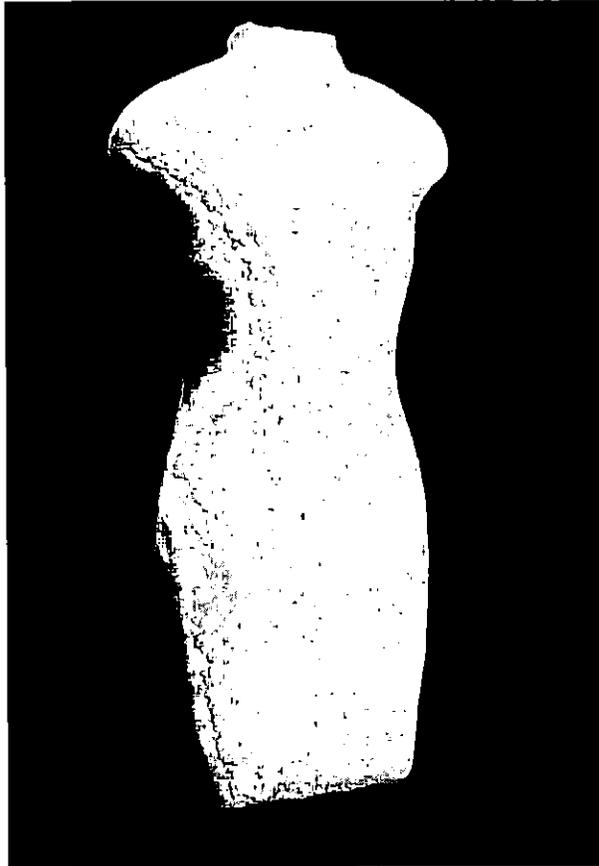
The resulting piece can now be glued into place and though it is square, it follows the shape of the front and left side and can be rounded easily. Repeat the operation for the remaining three sides. Once these pieces have been glued on a knife can be used to further sculpt the features of the torso. The shaping can be finished up using a portable belt sander to soften and round out the features.

Some people may find it somewhat difficult to visualize the round forms of a human figure within the squared off shape of this blocked out mannequin. After all few of us are regular Michelangelos. If that is so, why not use the flat surfaces at the top of the neck and lower end of the torso as a reference? Since these planes already have the correct width and depth, ovals can be drawn there that should make it easier to carve out the desired shapes. The contour line of these ovals represent the round form of the figure and you will get a direct reference showing you how to cut the neck and the lower end of the figure.

Though the topic of this article is the description of a fabrication technique rather than a lesson in anatomy, some time should be spent examining the shape of the shoulders.

Shoulders are not merely a rounded support onto which the garment rests. In order to produce a mannequin that will conform to the artifact, their shape should be studied and understood. For example, looking at either a model or an illustration, you will realize that the highest part of the shoulder is not at the center of the body or the center of the neck, but rather to the back. This is because the top of the shoulder is formed by the trapezius muscle, which stretches between the shoulder, the shoulder blade and the cervical vertebrae. This creates a sloping line which is quite visible on the frontal silhouette between the side of the neck and the top of the shoulder. It also creates a sloping plane towards the front of the body. It follows that the plane of the chest does not merely go up to the clavicles (collar bones), but extends all the way up to the trapezius muscles. The thickness of the shoulder (front to back) is not constant, but gets narrower as it goes up towards the back of the neck. Garments are made in accordance to this, so your mannequins should do the same. Also, since the top of the trapezius is more or less in line with the sternum (breast bone), the base of the neck (viewed from the side), will not be horizontal, but rather slanted, drawing a long curve in line with the chest. Shaping the throat like this is a good way to avoid "puffing up" the chest and allows the garment to drape in a more natural and more eye pleasing fashion.

If additional padding is desired, as is usually the case, a layer of polyester fiberfil can be added to the mannequin. First a slit is made with a knife along each side of the mannequin, from the base of the neck along the shoulder and down the side. The fiber-fill is then draped on the shoulders and using a putty knife, tucked into the grooves. Finally, everything is covered in cotton jersey, with the edges tucked into the grooves, or even in orthopaedic jersey such as "Stockinette", which can easily be slipped onto



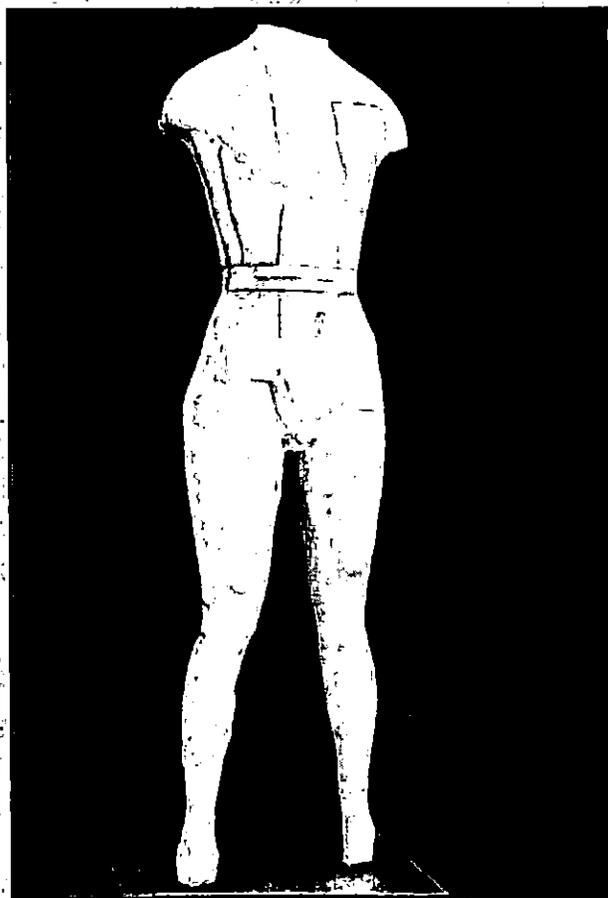
*Photo: 7, 8, 9.*

the mannequin (photos 7, 8, 9). Adjustments are then easy to make and the amount of sewing is reduced to a minimum. The jersey and fiberfil can readily be removed and replaced.

Once the article of clothing is on the mannequin the sleeves can be filled out a little with a bit of tissue paper or if preferred, the arms and legs can be shaped in the same way as the torso: the face-on and profile silhouettes are outlined on a piece of foam, then cut out with a bandsaw. These squared off arms or legs are then rounded and padded, and added to the mannequin using a piece of dowel, or a metal rod. For example several long tunics were to be displayed with short leggings and moccasins. A metal rod was inserted into the top of the leg and glued into position with about 10 inches protruding. The tip was ground into a point. With the body of the mannequin extended to within a few inches from the hem of the tunic, it becomes a simple matter to pin the leg into the underside of the mannequin. Incidentally, a 1/4" threaded rod works quite well as the threads seem to "bite" into the foam.

Mind you, in instances where you need the entire leg it is usually simpler to draw the legs with the torso, sculpting the whole "body" at once, and separate them afterwards if necessary ( I will get back to this in the next paragraph). This way all the components will fit together better. Project the entire figure onto a piece of ethafoam the same way you would a simple torso, but adding the legs to the figure. The side view silhouette however, does not need to be drawn and cut from head to toe. Just cut a regular side view of the torso and then, after assembling the two silhouettes together, add a bit of foam to the thighs, calves and heels on the front view silhouette, to make room for the thicker parts of the leg. You can then draw the side of the leg on the foam, either free-hand or you can go back to the overhead projector. Rounding, shaping and padding the legs is then done in the same manner as the shaping of the torso.

While working on "Threads of the Land", some items included both a long skin tunic and traditional trousers with sewn-in moccasins. This meant that these garments had to be supported not through the ankles, but from the waist. The mannequin was cut in half above the waist line of the pants, where a 3.5 cm ( 1/2") section of foam was replaced with a contoured piece of plywood of the same thickness. This piece of plywood was then glued to the bottom half of the mannequin and a 1/2" hole was then drilled into the back, to receive a steel rod. This rod, contoured to follow the back of the mannequin, was fixed into the floor. A small hole can be drilled through both plywood and support rod and a nail used as a locking pin (photo 10). This holds the mannequin in a standing position, while keeping the artifacts slightly off the ground. Make sure to notch the plywood in line with the groove on each side of the mannequin, about 3/16", before gluing, to accommodate the fiberfil padding. The nice thing about this two-part mannequin is that you can slip the bottom part of the mannequin into the trousers and secure them together to the support rod, before slipping the



*Photo: 10, 11, 12.*

torso in place (photos 10, 11, 12) and the tunic or parka over the whole thing. The two garments can be handled separately.

This article describes the basics of a technique which so far has been used with very positive results. Starting from the basic mannequin, one can of course develop much more elaborate shapes, designed to deal with specific situations. However I would like to emphasize that the simplest approach is usually the best. A painting instructor at O.C.A. used to say that if you had to mix more than three colours together to get the shade you wanted, you were probably on the wrong track. Keep it simple.

No one method will overcome all of the difficulties encountered when making mannequins or clothing props, and this technique is not touted as the definitive solution to the problem. It does however, allow for a three-dimensional form to be made fairly reliably and quickly, and it can be easily adapted to the garment to be displayed. The use of this technique is by no means limited to native garments. It has already been used to display military uniforms at the Canadian War Museum and was judged to be absolutely satisfactory. One final point before closing. In the context of "Threads of the Land" it was decided to give the mannequins a natural shape, allowing the artefact to drape over it. One can just as well opt for a more rounded form that follows more the shape of the garment and provides maximum support. It is up to each individual or institution to choose the approach they find preferable.

*Photographs: Ross Taylor*

Denis Larouche.  
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CMC February 1995

#### **Further Readings:**

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"Le stockage vertical: une question de cintres.", par Fabienne Vanderbrouck, tiré de "La Conservation des Textile anciens", Journées d'études de la S.F.I.I.C., Anger, 20-22, oct. 1994, S.F.I.I.C., 29 rue de Paris, 77420, Champs-sur Marne

"The making of polystyrene museum mannequins", by Gladys Serafino, Museum Quarterly, Spring, 1983, 4 pgs., illustr.

"Body Building" by Colleen Wilson, 1982, 6 pgs., illustr.