

CHAIN MAIL



TECHNIQUES

from the

Utah Shakespearean Festival

by Jeffrey Lieder

CHAIN MAIL COWL

MATERIALS

Size 15 knitting needles or size needed to achieve gauge.
1/2 lb. (230 ft) #36 Twisted Nylon Cord, dyed black

ABBREVIATIONS

k-knit	p-purl	pssso-pass slipped stitch over
sl-slip	rep-repeat	st(s)-stitch(es)
tog-together	inc-increase	dec-decrease
bo-bind off		

Gauge (taken in stockinette stitch): 2-1/2 stitches = 1 inch
3 rows = 1 inch

General Information: Pattern is reverse stockinette stitch (purl one row, knit one row, with purl as right side of garment). Join new cord at the ends, not in the middle, of the row. Measurements should be taken while garment is laying flat. Piece will be seamed at the center back.

Beginning at lower edge, loosely cast on 97 sts.

Row 1: Purl (right side).

Row 2: Purl.

Row 3: Purl.

Row 4: (K3, k2tog)•, rep from • across, end k2 (78 sts).

Row 5: Purl.

Row 6: Knit.

Row 7: Purl.

Row 8: Knit.

Row 9: Purl.

Row 10: (K3, k2tog)•, rep from • across, end k3 (63 sts).

Row 11: Purl.

Row 12: Knit.

Row 13: Purl.

Row 14: Knit.

Row 15: Purl.

Row 16: (K3, k2tog)•, rep from • across, end k3 (51 sts).

Row 17: Purl.

Row 18: Knit.

Row 19: Purl.

Row 20: Knit.

Row 21: Purl.

Row 22: K4, (K2tog, k8,)•, rep from • across until 7 sts remain, end k2tog, k5 (46 sts).

Row 23: Purl.

Row 24: Knit.

Row 25: Purl.

Row 26: Knit.

Row 27: Purl.

Row 28: Loosely bind off remaining sts.

Finishing: Knot ends of cord, otherwise they will ravel. Stitch the ends of the cord into the piece after weaving them in place to prevent raveling. After work has been foiled and set, stitch the center front seam by butting the edges of the seams together and overcasting, or zigzagging together by machine.

Many varieties and styles of chain mail have been used on the Utah Shakespearean Festival stages over the years. Early versions were made of steel links or metal parts from commercial dishwashing equipment. Later, pieces hand-knit from cotton or jute cord were introduced. These pieces were painted black and then coated with a layer of silver or gold metallic paint. Metal chain mail pieces although more realistic, were heavy and tended to rust, even in the desert environment of Cedar City. The chain mail made from cotton and jute cord absorbed perspiration, was difficult to clean and maintain, and did not hold the paint.

Knitting Patterns
by Martha A. Marking

We searched for better alternatives. In preparation for a production of *Richard II* in 1993, designer Janice Stauffer presented the idea of using nylon seine cord (fishing nets) and coloring it with metallic paint. This method of simulating chain mail with knitted cord achieved a very good look and we continued to develop a standard method of production.

Rudimentary knitting patterns were located and tested, and many errors were discovered. Janice refined the patterns, assisted by Rosemary Ingham and Janet Swenson. Martha Marking continued to refine and develop patterns for additional garments. Patterns for a cowl and a hood are included in this article; others are available on the TD&T Web site at www.usitt.org/tdt.index/extras/39-3chainmail.html.

Volunteers were recruited from the community and now there is a long list of volunteer knitters eager to help.

The chain mail is knitted with dyed nylon seine cord and treated with a textile adhesive. Mylar foil is heat-set on the surface of the pieces, seams are stitched and, in some cases, pieces are then set onto Spandex bases. Step-by-step instructions for the process follow.

PRODUCTION PHOTOGRAPHS BY KARL HUGH



PHOTOGRAPHS BY STEVE YATES



Production photos from the Utah Shakespearean Festival

DYEING

The white nylon cord is delivered wound on tubes, two pounds each. Wrap it into skeins to prepare for dyeing, tying the skein loosely in four or five places with twill tape. Hang the skeins on bent coat hangers to prevent them from tangling during the dye process.

Dye the cord and rinse thoroughly. You can use RIT Dye (three parts black, one part orange) but PRO Acid or Sabraset Dye provides darker, long lasting color. Check the PRO Chemical Web site (www.prochemical.com) for specific instructions. The skeins may twist and distort while hot, but they relax as they cool and dry. (See figure 1.) When dry, wind the yarn into balls for easy knitting.

Do *not* buy black cord, as we once did! It is black with tar so that repair knots in fishing nets hold tightly underwater. We thought that we could skip the skeining and dyeing process and sent the cord out neatly spooled on tubes with the plastic over-wrap in place. Cries were heard throughout the county as volunteer knitters struggled to work with the sticky jet black cord. We ordered white cord and dyed it, bought new knitting needles and started over.

xxx xxxxx as xxxxxxxx,
Richard III, 2003.

Jason Heil as Henry,
earl of Richmond,
Richard III, 2003.

Kathleen McCall as
Joan la Pucelle (Joan of
Arc) and xxxxx as
xxxxxxxxxxx, *The War
of the Roses*, 2000.

(opposite) Battle scene,
The War of the Roses,
2000.



KNITTING

Using the patterns provided, knit the cord into the shapes required. Adhere to the gauge so that the pieces fit when complete. Measurements should be taken while garment is laying flat. Pieces will grow *slightly* in length and width when heat pressed and foiled.

CHAIN MAIL HOOD

MATERIALS

Size 15 knitting needles or size needed to achieve gauge.
1 lb. (460 ft) #36 Twisted Nylon Cord, dyed black
Stitch holders (3)

ABBREVIATIONS

k-knit	p-purl	psso-pass slipped stitch over
sl-slip	rep-repeat	st(s)-stitch(es)
tog-together	inc-increase	dec-decrease
bo-bind off		

Gauge (taken in stockinette stitch): 2 1/2 stitches = 1 inch
3 rows = 1 inch

General Information: Pattern is reverse stockinette stitch (purl one row, knit one row, with purl as right side of garment). Join new cord at the ends, not in the middle, of the row. Measurements should be taken while garment is laying flat. Piece will open at center front.



Beginning at lower edge, loosely cast on 97 sts.

Row 1: Purl (right side).

Row 2: Purl.

Row 3: Purl.

Cowl Shaping:

Row 4: (K3, k2tog)•, rep from • across, end k2 (78 sts).

Row 5: Purl.

Row 6: Knit.

Row 7: Purl.

Row 8: Knit.

Row 9: Purl.

Row 10: (K3, k2tog)•, rep from • across, end k3 (63 sts).

Row 11: Purl.

Row 12: Knit.

Row 13: Purl.

Row 14: Knit.

Row 15: Purl.

Row 16: (K3, k2tog)•, rep from • across, end k3 (51 sts).

Row 17: Purl.

Row 18: Knit.

Row 19: Purl.

Row 20: Knit.

Row 21: Purl.

Row 22: K4, (K2tog, k8,)•, rep from • across, end k2tog, k5 (46 sts).

Row 23: Purl.

Row 24: Knit.

Row 25: Purl.

Row 26: Knit.

Row 27: Purl.

Row 28: Knit.

Row 29: Purl.

Row 30: Knit.

Row 31: Purl.

Row 32: Knit.

Row 33: P7, place these 7 sts on holder. P32 and leave on needle. Place last 7sts on 2nd stitch holder.

Row 34: K32 sts from needle.

Row 35: Purl.

Row 36: Knit.

Row 37: Purl.

Row 38: Knit.

Row 39: Purl.

Row 40: Knit.

Row 41: Purl.

Row 42: Knit.

Row 43: Purl.

Row 44: Knit.

Row 45: Purl.

Row 46: Knit.

Row 47: Purl.

Row 48: Knit.

Row 49: Purl.

Row 50: Knit.

Head Shaping:

Row 51: P20, p2tog. Turn.

Row 52: Sl 1*, k9, sl 1, k1, psso. Turn.

Row 53: Sl 1*, p9, p2tog. Turn.

Row 54: Sl 1*, k9, sl 1, k1, psso. Turn.

Row 55: Sl 1*, p9, p2tog. Turn.

Row 56: Sl 1*, k9, sl 1, k1, psso. Turn.

Row 57: Sl 1*, p9, p2tog. Turn.

Row 58: Sl 1*, k9, sl 1, k1, psso. Turn.

Row 59: Sl 1*, p9, p2tog. Turn.

Row 60: Sl 1*, k9, sl 1, k1, psso. Turn.

Row 61: Sl 1*, p9, p2tog. Turn.

Row 62: Sl 1*, k9, sl 1, k1, psso. Turn.

Row 63: Sl 1*, p9, p2tog. Turn.

Row 64: Sl 1*, k9, sl 1, k1, psso. Turn.

Row 65: Sl 1*, p9, p2tog. Turn.

Row 66: Sl 1*, k9, sl 1, k1, psso. Turn.

Row 67: Sl 1*, p9, p2tog. Turn.

Row 68: Sl 1*, k9, sl 1, k1, psso. Turn.

Row 69: Sl 1*, p9, p2tog. Turn.

Row 70: Sl 1*, k9, sl 1, k1, psso. Turn.

Row 71: Sl 1*, p9, p2tog (11 sts remain). Cut cord leaving a 3-4" tail. Tie a knot in end of cord. Place these 11 sts on the 3rd stitch holder.

Row 72: From right side (purl side), attach cord and p7 sts from 1st stitch holder. Pick up and p13 sts from finished face edge. P11 sts from next stitch holder. Pick up and p13 sts from second face edge. P7 sts from last stitch holder (51 sts).

Row 73: Knit.

Row 74: Purl.

Row 75: Loosely bind off remaining sts.

*Pull cord tightly while slipping stitches.

Finishing: Knot ends of cord, otherwise they will ravel. Stitch the ends of the cord into the piece after weaving them in place to prevent raveling. After work has been foiled and set, stitch the center front seam by butting the edges of the seams together and overcasting, or zigzagging together by machine.

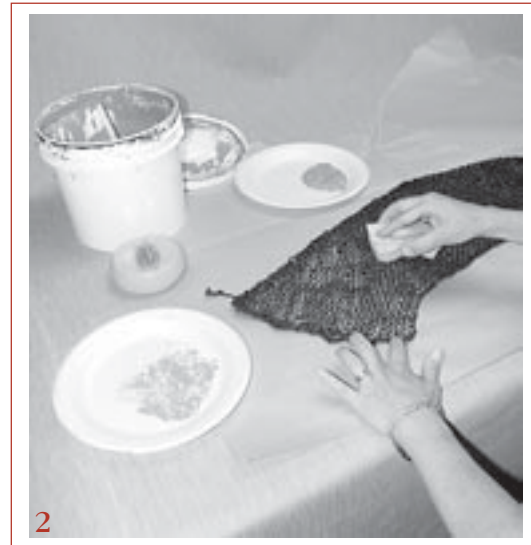
FOILING

Pin the knitted pieces, purl side up, to a paper-covered table. Make certain that the natural curl at the edges is pinned flat. Apply the non-toxic, water-based Foil-On Textile Adhesive as follows. Put a small quantity of adhesive on a paper plate. Dip a sponge in the adhesive and tap it on a clean plate to distribute the material evenly, and then pat the sponge on the knitted piece. Strive to coat only the top surface and do not force blobs of the adhesive into the depth of the knitted piece. Allow to dry to the touch. (See figure 2.)

Apply Mylar foil, color side up, to the adhesive coated surface. Mylar film is available in a variety of colors; we most often use silver, gold and copper. Cut the film into pieces so that it covers the surface of the knitted piece. Keep in mind the size of the paten on the heat press. Pieces of foil may overlap, take care not to press uncovered adhesive. The scraps and pieces can be used until all of the color is removed. (See figure 3.)

Press the piece in a heat transfer press for 20 to 30 seconds at 325° to 350° at moderate pressure (50-60 psi). Protect the bottom paten with a covering of clean muslin. Do not overheat the foil. If you don't want to invest in a heat transfer press, a local tee shirt shop might let you use theirs for an afternoon. Once the pieces are knitted and the adhesive is applied, the foiling process goes quickly. A commercial iron can be used, but it is difficult to maintain even pressure and is a slow process. (See figure 4.)

Allow the film and knitted piece to cool *stone cold* before removing film. Peel the film slowly and carefully, starting at a corner or edge. If a more matte finish is preferred, place the piece in the press a second time, cover with parchment paper and re-press for ten seconds. (See figure 5.)



FINISHING

After foiling is completed, stitch the underarm or inseam seams together by hand or butt the edges and zigzag by machine. If there is a "bald spot" in the foil coating after stitching, coat lightly with adhesive and repeat heat set process for that area. Lessen the pressure of the press to allow for a double thickness and cover all previously foiled areas with film or parchment paper.

The full tunic fits closely around the neck so a placket opening at the shoulder is required. Make the placket from 5/8" black gros-grain ribbon and close with medium size snaps.

If the body is covered with armor or other clothing, attach sleeves to Spandex tunic bases. We use Jumbo Spandex bodies with nylon parka zippers up the back. Many of the pieces created for the 1993 production of *Richard II* are still in use at the Festival.

For leggings or braies, stitch a will tape or bias tape casing and insert a 1" non-roll elastic at the waist. Hoods and cowls need only be stitched up the center front seam and are easily pulled over the head.

If the metallic surface is too bright, an FEV (French enamel varnish) glaze can be applied to age or dull it. The metallic quality will dull over time; some designers prefer the duller, aged quality.

Finished pieces can be machine-washed with Dreft detergent and cold water on a short, gentle cycle. Turn pieces inside out to wash. Lay flat to air dry. DO NOT dry clean. DO NOT use bleach.

Jeffrey Lieder is Costume Director at the Utah Shakespearean Festival and has supervised more than 100 productions during the past 18 seasons. He is also Associate Professor and Head of Costume Production at the University of Wisconsin-Milwaukee. He doesn't know how to knit.

Martha A. Marking is Costume Designer for the Greenshow and the Royal Feaste at the Utah Shakespearean Festival and Associate Professor of Theatre and Head of Design/Technology Program at Appalachian State University in Boone North Carolina. She is an expert knitter.

Both are active members of USITT.

SUPPLIES AND EQUIPMENT

ADHESIVE AND MYLAR FILM

Screen-Trans Development Corp,
Moonachie, NJ 07074, 201 933-7800
201 804-6371 fax: attn. Dianna

Foil-On Textile Transfer Adhesive, Water Based, non-toxic
Sample kit \$15.00 each (includes shipping)
\$25.00 min credit card order

HEAT PRESSES

National Screen Printing Equipment
1401 N Broadway, Pittsburg, KS 66762
800 843-3928

Heat Transfer Machines
GM4000 15"x15" \$725.00
GM1620 16"x20" \$935.00

NYLON SEINE CORD

Coast Marine
398 Jefferson Street, San Francisco, CA 94133
415 673-1923

#36 Seine cord, 3 ply twisted available in 2 lb. tubes

DYE

PRO Chemical & Dye Co.
P.O. Box 14, Somerset, MA 02726
800 2 BUY-DYE

PRO Acid and Sabraset Dye and assistants
www.prochemical.com

JUMBO SPANDEX

Baer Fabrics
515 East Market Street, Louisville, KY 40202
800 769-7778

INFORMATION

UTAH SHAKESPEAREAN FESTIVAL
351 West Center Street, Cedar City, UT 84720
www.bard.org

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