

**TEXTILE PERIODS IN
ANCIENT PERU
III: THE GAUZE WEAVES**

BY

LILA M. O'NEALE and BONNIE JEAN CLARK

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BIBLIOGRAPHICAL ABBREVIATIONS USED

AA	American Anthropologist
AMNH-AP	American Museum of Natural History, Anthropological Papers
FMNH-AM	Field Museum of Natural History, Anthropology, Memoirs
RMN	Revista del Museo Nacional, Lima, Peru
UC-PAAE	University of California Publications in American Archaeology and Ethnology

TEXTILE PERIODS IN ANCIENT PERU

III: THE GAUZE WEAVES

BY

LILA M. O'NEALE AND BONNIE JEAN CLARK

INTRODUCTION

THE GAUZES are among the most extraordinary of the many fine weavings of ancient Peru. To be sure, not all gauze-woven cloths merit that adjective, but there are enough to which it can be applied to maintain the high position of the group as a whole. Some gauzes have striking aesthetic qualities, some are impressively complicated in technique, and a considerable number belong in both categories.

This study amplifies the results of an investigation of twenty gauzes of the Late period undertaken by the junior author and presented in partial fulfillment of the requirements for the Master's degree in the Department of Decorative Art at the University of California. The schematic drawings and the reconstructions of gauze techniques were sections of her thesis.

We have also incorporated material from a preliminary analysis of gauzes from Supe district sites previously made by Geraldine L. Strizich. Certain text figures showing gauze patterns were rendered in brush techniques by Margaret C. Estep as an experiment in textile illustration. Both of these projects were carried on in a course in textile technology.

Although only sixty-seven cloths form the basis of this study of gauzes, they are fairly representative of their periods. The majority of the specimens are from the Uhle collections in the University of California Museum of Anthropology. In the text, these specimens are identified by the capitals UC preceding the number. Three specimens from Early Nazca sites are part of a large collection kindly made available for analysis some years ago by the Field Museum of Natural History, now the Chicago Natural History Museum. Specimen numbers of these textiles are preceded by the capitals CNHM. Gauzes in three Peruvian museums were analyzed by the senior author. Catalogue numbers of specimens from the Museo Nacional (Lima) are preceded by the capitals MN; those from the Museo de Historia Nacional (Lima) by MHN; and those from the Museo de Antropología y Investigaciones Prehistóricas (Magdalena Vieja) by MA. The opportunity to work on these collections was made possible by a Latin-American Exchange Fellowship from the John Simon Guggenheim Memorial Foundation.

All the gauze-woven fabrics for which we have analytical descriptions come from coastal sites. Some lots and individual cloths are assignable to periods by means of the pottery associated with them in the graves; other lots and cloths are tentatively classified with respect to period by their stylistic similarities to excavated specimens. The following tabulation shows the geographical and chronological range of the material on which this study is based.

Early cultures (7 pieces):

Pisco Valley: Museo Nacional, museum staff excavations in 1930 (?) at Caverns II and V of Terrace II, Cerro Colorado, Paracas, period probably antedating Early Nazca, 4 pieces (8457a, 25044-25046).

Nazca Valley: Chicago Natural History Museum, by A. L. Kroeber from excavations in 1926, Early Nazca period, 3 pieces (Majoro 170476f', Cahuachi 171110, 171141).

Middle cultures (21 pieces):

Supe Valley: Various sites, University of California, by M. Uhle from excavations in 1905, 17 pieces (San Nicolas 4-7152, 4-7481a-k, 4-7506; Huaral Viejo 4-7543, 4-7556; Supe district 4-7550, 4-7550a).

Chillon: University of California, C. Uhle, tentatively classified Middle, 1 piece (Chillon 16-1676).

Ancon: University of California, by M. Uhle from excavations at Site M in 1904, 1 piece (Ancon 4-6340).

Nazca Valley: University of California, M. Uhle, tentatively classified as Epigonal (and Y), 1 piece (Tunga 4-8441).

Unknown provenience: University of California, M. Uhle, tentatively classified Middle, 1 piece ("Peru" 16-1675).

Late cultures (39 pieces):

Moche (Trujillo) Valley: University of California, T. D. McCown, Late Chimú, 1 piece (Chanchan 16-6866b).

Chancay Valley: University of California, M. Uhle by excavation at Site A, 1 piece (Chancay 4-6408d), at Site D, 1 piece (Chancay 4-6725); University of California, C. Uhle from Site A, and therefore mainly Late, 11 pieces (Chancay 16-1081, 16-1092, 16-1093, 16-1181, 16-1635, 16-1637a, 16-1638, 16-1643, 16-1649, 16-1650, 16-2016); Museo de Historia Nacional, L. Charon gift, Late, 1 piece (Chancay 2942).

Ancon: University of California, M. Uhle by excavation at Site T, 1 piece (Ancon 4-5883); C. Uhle, probably mainly Late or Inca, 7 pieces (Ancon 16-971-16-973, 16-978, 16-988, 16-2117, 16-2118); Museo de Historia Nacional, by excavation in 1908 east of Pueblo Nuevo, 1 piece (Ancon 6225a).

Lima Valley: Museo de Historia Nacional, by excavation in 1906 at Ate, 4 pieces (Ate 2429, 2439, 2440, 2445); Chorrillos, by purchase, 1 piece (Chorrillos 1349).

Huacho: University of California, M. Uhle, 1 piece (Huacho 4-7565b).

Ica Valley: University of California, M. Uhle by excavation at Sites D and T, 3 pieces (4-4991, 4-5473e, g); tentatively assigned to Late Ica, 1 piece (Ica or Chíncha 16-1499).

Unknown provenience: Museo de Antropología y Investigaciones Prehistóricas, Late, 5 pieces (2586, 2587, 2617, 3141, no number).

THE GAUZE WEAVE

Like other loom-made fabrics, gauzes have warp and weft elements; but a special constructional feature distinguishes cloths of gauze weave from those lacelike, sheer, or open-weave fabrics, such as voiles, which in published reports are often wrongly designated as gauzes. The need for clear-cut differentiations was felt when we attempted a preliminary survey of gauze weaving outside of South America. Much of the otherwise valuable information was open to question by reason of confused terminology.

Common usage among manufacturers and retailers has given "gauze" an extended meaning to cover loose, low-count cottons like cheesecloth and bandage materials. Technically, these are plain-weave fabrics exemplifying the simplest over-one-under-one interlacing. The true gauze weave is, however, recognized. It is always mentioned in connection with curtain materials such as the marquisesettes.

Characteristic gauze is light and transparent, often gossamerlike in appearance. In the Far East in ancient times, and later in Europe, it was woven of silk. In ancient Peru, cotton and occasionally wool were the basic fibers. Many of the Peruvian gauzes are filmy, but there are also examples of closely woven gauzes.

Plain gauze (pl. 3, *a*) embodies the principles underlying the construction of all warp-crossed textiles. Various definitions have been offered, and in some the misleading inclusion of the word "twist" should be noted. Means¹ writes: "The peculiarity of gauze is that the warp threads are paired and twisted loosely around each other, spirally, throughout their length in such a way that one or more wefts can be passed through the loose bends which they combine in forming." But the twisting process is one of uniting by winding one thread around another; it identifies twining techniques and card- or tablet-weaving. The term "spiraling" applies to them, but not to gauze weaves. In true gauze weaving, threads are deflected from a parallel position to cross and recross, but at no time do they twist or spiral completely around one another.

All explanations of the true gauze weave give emphasis to its additional characteristics: (1) that the warp yarns are grouped to form units of twos, fours, sixes, and eights; and (2) that the weft yarns are kept parallel to each other at distances depending upon the type of gauze being made. Crawford² gives as the principle of gauze weaving "that adjoining warps or groups of warps are twisted one half turn about each other and the crosses made secure by the insertion of a weft pick or picks." Barker and Midgley³ define gauze as "a type of fabric in which certain of the threads although keeping approximately in the same plane are deflected from the straight line in order to produce spider's web and other well recognized gauze styles." The most explicit definition found, and the one basic to this study, is that of Reath and Sachs:⁴

¹ Philip A. Means, *Ancient Civilizations of the Andes* (New York, 1931), p. 489.

² M. D. C. Crawford, *Peruvian Fabrics*, AMNH-AP 12 (1916): 141.

³ A. F. Barker and E. Midgley, *Analysis of Woven Fabrics* (London, 1914), p. 267.

⁴ N. A. Reath and E. B. Sachs, *Persian Textiles* (New Haven, 1937), p. 64.

"Gauze weaves: The subheading for all fabrics in which certain of the warp threads, before the insertion of a line (or shot) of weft, cross over adjoining warps, and are then held in place by the weft. Spaces usually appear between the lines of weft and between the groups of crossed warps making the finished fabric an openwork material."

Part of the difficulty of framing a simple definition for the gauze techniques lies in the fact that gauze-woven cloths are similar in their general appearance to those fabricated by means other than the loom. For example, after a reasonably clear description of gauze weaving, Symonds and Preece⁵ speak of the "resultant texture being open or net-like in character." Other single-element techniques yielding gauzelike webs besides net are those dependent upon knotting. Our filet lace is a familiar type. Loom-made gauzes are also confused with other warp-weft products. The plain cheesecloth has been mentioned as one of these, but there are also loosely woven materials with spaced warps and wefts, cloths in the open-weave types known as the Bronsons, and the so-called "nets of the loom" (*redes de telar*) found among the older Spanish textiles.⁶ In this connection it is interesting to note that the device called by modern craftsmen the "Spanish stitch" had a recognized value among the Middle-period weavers at Supe (pl. 13, *a*). Finally, gauzes are sometimes confused with needle-made textures such as drawn work, interlaced hemstitching, and the earliest lace forms, one of them made by drawing threads from loosely woven linen and embroidering in the spaces so formed (*Punto tirato*), and the other a darned net (*Punto Ricamato a maglia quadra*).⁷

⁵ Mary Symonds and Louisa Preece, *Needlework through the Ages* (London, 1928), p. 110.

⁶ Mildred Stapley, *Popular Weaving and Embroidery in Spain* (New York, 1924), p. 16.

⁷ A. M. Sharp, *Point and Pillow Lace* (New York, 1913), pp. 16, 19.

GAUZE-WOVEN MATERIALS

EARLY-PERIOD GAUZES

With the aid of the published literature we have attempted a classification of our gauze specimens in accordance with their probable uses. These have been determined largely on the basis of size, shape, and appearance, that is, texture and decorative features.

The catalogue of the National Museum (Lima) designates all four pieces from Paracas Caverns as wrappings or shawls. The two largest have the following dimensions:

MN 8457a (pl. 12, b, c)	72 inches long by 27 inches wide
MN 25045	69 inches long by 26 inches wide

Each mantle is constructed by seaming together the side selvages of two breadths approximately 13 inches wide. The remaining two specimens, MN 25044 and 25046, have incomplete lengths of 34 and 41 inches respectively, but their complete widths, too, are approximately 26 inches, similarly the result of seaming narrow webs. The four specimens are of white cotton.

The Nazca Valley cloths are also garment materials. The largest Cahuachi cotton fragment (CNHM 171110) is incomplete both warpwise and weftwise (32 in. by 9 in.), but its texture (pl. 12, a) indicates mantle material. A second Cahuachi fragment (CNHM 171141) was probably the same type of garment; it is hardly sheer enough to suggest veiling. The Majoro wool bits, all very small, do suggest scarf or kerchief materials. The forms of decoration, both inwoven and applied (fig. 1), set this piece apart from the other two.

MIDDLE-PERIOD GAUZES

We have twenty-one examples of gauze-woven textiles from Middle-period sites, all but four of them from the Supe district (cf. pl. 13, a-c). Judging by dimensions and textures, twelve of these pieces are most appropriately described as mantles. The remnants give evidence that Supe mantles were large, and certain particulars, especially the scale and proportions of the patterned sections, are common to them all.

No one of the dozen pieces is complete in length, but one of them (UC 4-7152) measures just under 3 yards. Supe weavers followed a convention, how strictly observed we cannot tell from the available material. At one end of each breadth they wove a heading piece. This first small section served to establish the width of the web. On all the specimens measured (table 1) the headings are from $\frac{1}{2}$ inch to 2 inches deep. Today's stick-loom weavers customarily follow the same procedure when, after weaving the heading strip, they turn the loom end-for-end, thereby placing the strip at the far end. They then begin weaving at the end nearest them and continue until their work joins the first heading strip.

Although the Supe mantles do not supply any intact ends to show the entire depth of the second section of plain weaving, this second section was obviously of considerably more importance than the first or heading strip. For example,

UC 4-7152 with its incomplete length of 106 inches has an intact inch of plain weaving at one end and a 55-inch remnant at the other end. How much deeper that section was originally can only be surmised. Between these two end sec-

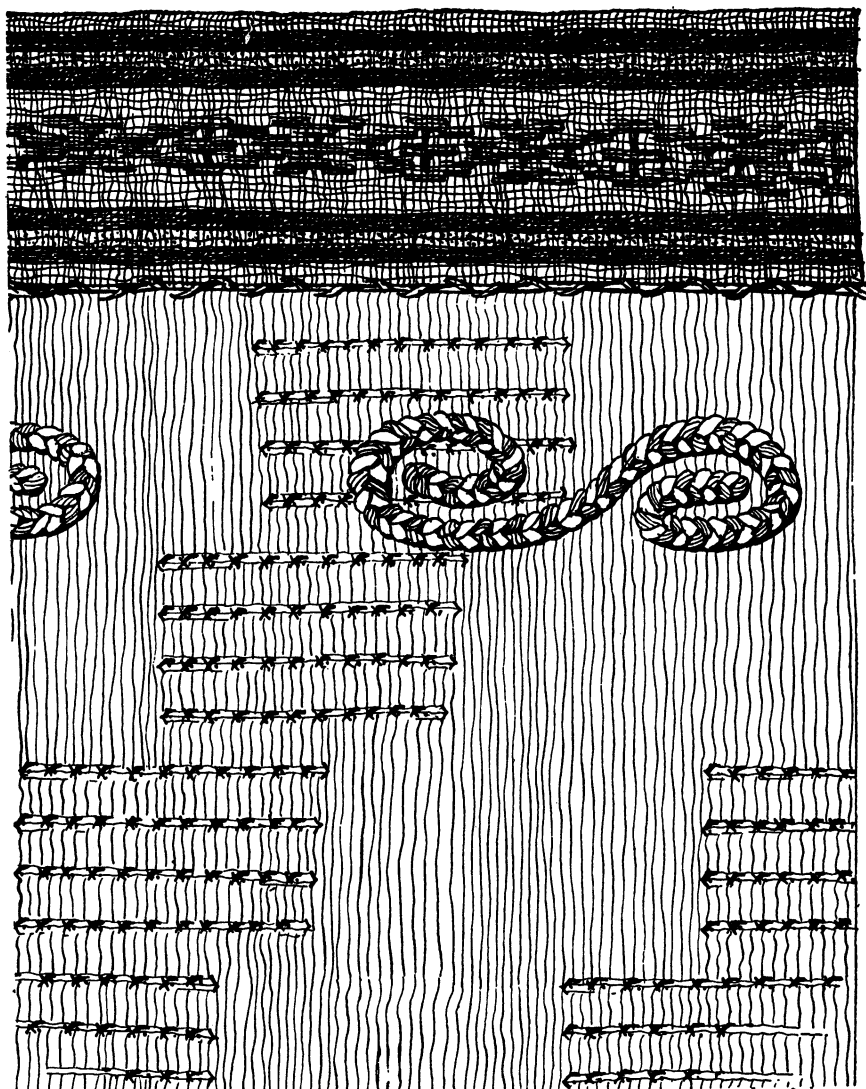


Fig. 1. Gauze-woven pattern lines in plain-weave fabric. Majoro, Nazca. CNHM 170476f¹: Early-period fragment of medium-blue wool with pattern of gauze-woven lines. Pattern-weave border 1 inch wide.

tions this same mantle has a 50-inch gauze-patterned section (pl. 13, c). Two other mantles, UC 4-7481f and g, have 44 inches and 50 inches respectively of gauze patterning flanked on one end by a heading strip, and on the other end by greater depths of plain weave. If the depth of the gauze-woven portion by Supe convention represented approximately half the total length of the mantle,

these three mantles are in the 3-yard category. So also might be three other mantles listed in the table, since the remnants of their gauze-woven sections are all longer than 38 inches.⁸

The original breadth measurements of the Supe mantles are as uncertain as the original lengths. All the garment rectangles were formed by seaming together narrow webs, each of which was from 10 to 12 inches wide. How many of these were the conventional or the desirable number cannot be answered from the dozen available specimens. Six consist of fragments of two webs still firmly held by whipping-stitch seams. One of the six (UC 4-7481g) has rem-

TABLE 1
CONVENTIONAL COMBINATION OF PLAIN-WEAVE AND GAUZE-WEAVE SECTIONS
(Measurements in inches)

Specimen no.	Plain weave, intact end (proximal)	Plain weave, frag. end (proximal)	Gauze section, intact	Gauze section, fragmentary	Plain weave, intact end (distal)	Plain weave, frag. end (distal)
UC 4-7152.....	1	..	50	..	..	55
UC 4-7481a.....	..	1	..	1	..	..
UC 4-7481b.....	..	1.5	..	38.5	..	..
UC 4-7481c.....	..	2	..	28	..	..
UC 4-7481d.....	1	..	..	19	..	..
UC 4-7481e.....	..	2	..	19	..	..
UC 4-7481f.....	..	0.5	44	..	..	16
UC 4-7481g.....	1	..	50	..	..	8
UC 4-7481h.....	1	..	..	25	..	..
UC 4-7481i.....	1.5	..	..	18	..	..
UC 4-7481j.....	..	..	..	40	..	..
UC 4-7481k.....	1, 1.5	..	..	50	..	..

nants of sewing thread on the two outer selvages, traces indicating that at least four webs were involved. Two fragmentary specimens are composed of three breadths, but here again remnants of sewing threads on the outer selvages of one (UC 4-7481f) show that the garment was at least five webs wide. Two fragmentary specimens have four webs seamed together. One (UC 4-7481k) has traces of thread on one outer selvage, and the other (UC 4-7481c) has them on both, indicating an original mantle at least six webs wide. These two are the widest specimens from Supe. UC 4-7481k measures over-all 45.5 inches, to which can certainly be added 10 to 12 inches; another, UC 4-7481c, now measures 48 inches, and to it can be added another 20 to 24 inches.⁹

A strip of plain-weave white cloth from an unknown provenience ("Peru" 16-1675) is ornamented near the center and on one end by 10-inch bands of pattern in gauze weave. The dimensions (incomplete length 58 in. by complete width 15 in.) suggest mantle material. The interlocking serpent motive is

⁸ Three yards is not an excessive length for the ancient mantles. Nearly 90 per cent of the 70-odd Paracas Necropolis mantles analyzed were found to range from 83 to 144 in., with the median at 106 in. (Unpub. MS, L.M.O.)

⁹ Intact breadths of 70 per cent of the 70-odd Paracas Necropolis mantles measured ranged from 31 to 64 in., with the median at 52 in. (Unpub. MS, L.M.O.)

similar to those in the Supe cloths except for its placement in crossbands. No one of the fragments which we tentatively classify as mantles is so patterned.

The smaller rectangular pieces entirely or partly in gauze technique are comparable to scarves or head veils. There are four of these, three from the Supe Valley: UC 4-7556, constructed of two 17-inch webs, is squarish; UC 4-7543 is a small blue fragment of very fine weaving, and the only colored gauze in the Supe lot; UC 4-7506 is distinguished by its embroidery, which is described under "Supplementary Techniques" (pls. 5, *d*; 6, *c*; 11, *b*). The remnant of a veil from the Nazca Valley (UC 4-8441), 32 inches long by 25 inches wide, is formed by seaming together two webs. Its chief interest is its heliotrope color.

The Middle-period lot contains three specimens of unmistakable character, all of them infants' shirts. The two from Supe (pl. 18, *b*, *d*) are ordinary garments. Each has a body section consisting of a single web (approximately 34 in. long) folded on the transverse center, and squarish sleeves made of two separately woven webs. The sleeve webs were woven some 8 inches long and 14 inches wide; each was folded on the lengthwise center. Gauze-woven sections make decorative 3-inch borders for the lower edges of the sleeves and 5- to 6-inch borders for the fronts and backs of the body sections. Neither garment fragment equals half its original width; consequently there is no indication of the type of head opening devised by the Supe weavers.

An excellent bit of evidence of the time, patience, and skill devoted to the making of the third child's garment is supplied by an Ancon specimen combining gauze weaving and needle techniques (pl. 6, *a*, *b*). The garment is fragmentary, yet it would appear wide enough to represent more than half the original breadth. Since no provision has been made for an opening for the head to go through, the shirt may be incomplete, or it may be a funerary offering, not designed for actual wear. There are a dozen or so miniature garments among the collection from the Supe district, evidently symbolizing the needs of the dead in the next world, and we know of much earlier ones from Paracas Caverns.¹⁰ The measurements of the Ancon specimen in its present condition are as follows: body web, 27 inches long (making a garment length of 13½ in.) by 27 inches wide, incomplete; sleeve webs, fragmentary length of a few inches by 11 inches wide, complete. Folding the webs on the transverse center probably formed a squarish sleeve. The whipping stitches fastening the sleeve top into the armscye are so close-set as to be almost invisible.

The Chillón fragment in the Middle-period lot (UC 16-1676) is an incomplete length of material 55 inches long by 17 inches wide, apparently used as a binding strip. It may possibly have been designed for a loincloth, although the placing of the second gauze-patterned band nearly 40 inches up from the intact end makes this unlikely. No information accompanies the specimen, but its texture and the design motives in its bands (pl. 18, *c*) are almost the same as those of the Supe shirts (pl. 18, *b*, *d*).

¹⁰ L. M. O'Neale, *Pequeñas prendas ceremoniales de Paracas*, RMN 4 (1935): 245.

LATE-PERIOD GAUZES

Gauzes of the Late and Inca periods represent greater variety in texture than those of the earlier periods, and a correspondingly greater number of uncertainties about the uses to which they were put. Descriptions of Inca costumes are chiefly concerned with men's tunics and shirts, breechcloths, and mantles. Women's costumes usually included long tunics, mantles, and the important accessory, a veil or headcloth.¹¹ Emphasis is generally placed upon fabrics of tapestry and brocaded types. Means¹² introduces his Class VI, "Gauzes and Voiles," with the statement that it "is one of the least studied of Peruvian textiles because, no doubt, it presents no ostentatious magnificence to the eye." Gauzes, unlike nets, are rarely mentioned by name. Sheerness in a headcloth usually implies a voile or gauze.

TABLE 2
MANTLE DIMENSIONS
(In inches)

Specimen no.	Site	Length, complete	Length, incomplete	Breadth, complete	Breadth, incomplete	Single webs	No. of webs
MA no number . .	?	123	..	109	..	26, 28	4
UC 16-1081	Chancay	93	..	53	..	17, 19	3
UC 16-1092	Chancay	..	43	..	35	21	2
UC 16-1635	Chancay	..	39	..	28	19, ?	2
UC 16-1181	Chancay	..	37	..	46	20	3
UC 16-1649	Chancay	..	21	..	40	22	2

The most likely interpretation for the majority of the fragmentary Late textiles available for our analysis appears to be that they were headcloths or mantles. One reason for the preponderance of these articles in the group may be the fact that more than half the lot are in the C. Uhle collection from the Chancay-Ancon district. These pieces appear to be a group selected for their showy technical processes.¹³

As in the preceding periods, large cloths are formed by seaming together the lengthwise selvages of two or more pieces. The narrowest gauze web is a band 5 inches wide (MA 3141 from an unknown site) woven expressly as foundation material for embroidery; the widest are two 28-inch webs forming sections of a large mantle (catalogue number missing) at the Museo de Antropología (Magdalena Vieja). Most of our thirty-nine specimens in the Late group fall within a width range of from 11 to 22 inches. This range correlates with previously recorded findings for the thousand-odd fabrics presumably woven on ordinary stick (backstrap) looms. By far the greater number of those cloths fall within the limits of 12 to 26 inches.¹⁴

¹¹ Gösta Montell, *Dress and Ornaments in Ancient Peru* (Gothenburg, 1929), pp. 173-236; Means, *Ancient Civilizations*, pp. 477-482.

¹² *Ancient Civilizations*, p. 512.

¹³ L. M. O'Neale and A. L. Kroeber, *Textile Periods in Ancient Peru*, UC-PAAE 28 (1930), table 4.

¹⁴ L. M. O'Neale, *Textile Periods in Ancient Peru*, II, UC-PAAE 39 (1942): 151. Herein cited as *Textile Periods II*.

Late-period gauzes classified by their dimensions as having probably been mantles are listed in table 2 in the order of their lengths. It should be stated that over-all dimensions cannot pretend to accuracy. The creped yarn in these pieces combined with the elasticity of the gauze technique permits extension or contraction (pl. 9, *b*). Measurements were taken as the cloths lay on the table, since many are too fragile to draw out to an approximate loom tension.

Specimens tentatively classified by their dimensions as headcloths are listed in table 3. Several other remnants similar in texture to mantles and headcloths are very small, or their breadth dimensions could fit them into either classification. For example, plate 17, *b* is a two-web fabric 33 inches wide. The length, 13 inches, is indeterminate, thus preventing our classifying the textile as a mantle or headcloth.

TABLE 3
HEADCLOTH DIMENSIONS
(In inches)

Specimen no.	Site	Length, complete	Length, incomplete	Breadth, complete	Single webs	No. of webs
UC 16-972.....	Ancon	37	..	36	17, 19	2
UC 16-1638.....	Chancay	35	..	32	16, ?	2
UC 4-6725.....	Chancay	29	..	28	14, ?	2
UC 16-1650.....	Chancay	29	..	28	14, ?	2
UC 16-2016.....	Chancay	..	32	36	18, 18	2
UC 16-1093.....	Chancay	27	..	32	17, 15	2
MNH 2942.....	Chancay	26	..	15	15	1
UC 16-1643.....	Chancay	25	..	29	14, 15	2
UC 4-4991.....	Ica	23	..	23	23	1
UC 4-7565b.....	Huacho	15	..	32	16, ?	2

Two brown-and-white specimens from Ica and one from Ancon are like many of the old Peruvian gingham in appearance, except that these Late-period cloths have gauze-woven stripes in addition to color changes both warp-wise and weftwise. The Ica pair (cf. pl. 15, *b*) are cross-striped with narrow gauze bands. The Ancon fragment (MHN 6225a) has wider gauze bands, but the style and texture are similar to those in the Ica pieces. None of the dimensions gives a clue to the original sizes; hence we do not know whether these cloths were woven for mantles, headcloths, or garments.

A Chorrillos fragment (MHN 1349) is catalogued as an apron, although neither dimension (16 in. by 12 in.) gives any aid in so classifying it. This piece has an interesting border (fig. 9, *d*) which is commented upon in the section "Color and Pattern."

Four specimens from Ate and two from an unknown site are white and brown sleeveless shirts with some amount of gauze weaving in them, and for all but one garment we have complete dimensions. All the shirts are made by joining the long edges of two separately woven webs. For MHN 2439, 2440, and 2445, single webs are approximately 72 inches long by 15 inches wide; for the two shirts from an unknown site (MA 2586, 2587), the webs are 76 inches long by

16 inches wide. The finished garments made by folding the seamed rectangle on its transverse center are either 36 inches long by 30 inches wide or 38 inches long by 32 inches wide.

All the shirts have some decorative features in gauze technique. This technique is of varied importance: the simplest shirt has a group of five bands (fig. 10, *b*) with spaces between them; the more elaborate specimens use the gauze technique only to form lines separating bands in different techniques (fig. 9, *e*).

A child's sleeved shirt (detail in pl. 18, *a*) has an openwork border at the bottom and around the lower edges of the sleeves. The border is flanked by double lines of gauze weave. No neck opening has been cut. The measurements are: length as worn, 15 inches; width, a single breadth, 19 inches; sleeves, 13 inches long by 7 inches wide.

One rather complicated dark blue textile lacking provenience (MA 2617) is catalogued as a skirt (?) or mantle (?). Its full length is 93 inches, its full width 42 inches, this latter width being divided mainly into two sections—one consisting of alternately plain- and gauze-weave crossbands, and the other of plain gauze allover. These two sections, 93 inches by 21 inches, and 93 inches by 16 inches, are seamed on their lengthwise edges. The remainder of the total width is accounted for by a band, tabs, and a fringed tape.

YARNS

Peruvian gauze weavers had standards of workmanship as high as those of the weavers of other fine cloths, the brocaded webs, tapestries, and pattern weaves. Transparency in the lacelike gauzes was achieved by skillful manipulation of yarns; hence, much of the responsibility for quality devolved upon the spinners, since indifferently prepared fibers and loosely twisted strands would defeat the very object of employing gauze techniques.

The amount of twist given a strand is highly important in gauze weaving. Through use of supertwisted yarns—the tight crepes—a web designed to be transparent was also made strong and resilient. The Peruvians demonstrated by countless weavings that the added strengthening twist compensated for the fineness of single-ply yarns and made doubling and trebling unnecessary. Furthermore, creped yarns provide a certain amount of what modern spinners call “bite,” not only to secure the crossed warps characteristic of gauzes, but also to aid in maintaining the parallel positions of the wefts. When a gauze web is released from loom tension, yarns twist and often form little curls (pls. 19, b; 21, etc.). It is only by holding some gauzes out taut as if they were still bound in place on loom bars that the lay observer understands how it was possible to weave with such unruly yarns. So elastic is the fabric of UC 16-1638 that a 2-inch square can be enlarged to 3 inches. D’Harcourt¹⁶ regrets that the tight spinning of the simple cotton threads too often gives the Peruvian gauzes a creped appearance which may even obscure the decorative intentions of the artist.

Not all yarns were spun to the tight crepe stage. Single-ply yarns moderately creped produced sheer webs with a pleasing pebbled texture. There is, too, a noticeable variation in the degree of twist given yarns spun for use in cloths for different purposes. The comparison is obvious in two groups represented by plates 9, *a* and 18, *c*. The first is a filmy mantle, woven of single-ply yarns tightly creped; the second may have been a loincloth. The compactness of the weave is broken only by decorative bands formed by gauze lines. The single-ply yarns in this specimen are coarser and somewhat fuzzier than those in the mantle.

A third group gives evidence of yarn choices made by the spinner-weavers. In some cloths we find yarns with different degrees of twist: tight and slack used together, hard and slack, crepe and medium twist. It seems certain that these were deliberate variations with at least two objectives: (1) to form desirable contrasts in textures between solid crossbars and transparent rectangles (pl. 19, *b*), and (2) to strengthen the whole fabric (pl. 16, *a*). Entered on our chart are several others in the same class, for example, UC 16-1637a, a sheer, loosely woven crepe voile (pl. 17, *b*) with gauze techniques forming the pattern motives. Flanking the gauze section is a band made of slack-twisted yarns. The same strengthening purpose is served by the crossbands of plain weave in slack-twisted yarns in UC 16-971 (pl. 20, *b*) and UC 16-2117.

¹⁶ Raoul d’Harcourt, *Les Textiles anciens du Pérou et leurs techniques* (Paris, 1934), p. 151.

Single-ply yarns are the typical but not the only yarns for gauze weaving in the Middle and Late periods on the coast. The seven Early-period gauzes available from the Nazca Valley and Paracas Caverns are all woven with two-ply yarns, one being a Majoro specimen of wool two-ply, the other six of cotton. The amount of twist is rarely uniform in any given length of handspun yarn (pl. 21), particularly in crepe-twist yarns, but in the main the Early-period range is between the medium and hard twist with no perceptible emphasis on supertwisted or crepe yarns.

Among the Middle-period specimens analyzed, one Ancon and one Supe cloth are woven with two-ply yarns. The first is the much embellished child's shirt (pl. 6, *b*) and if it was designed for actual wear the heavier yarns were a logical choice. The texture is much more compact than any that could have been produced by single-ply yarns. The Supe fabric (pl. 6, *c*) is a heavy plain gauze with deep border in embroidery technique. This decorative feature explains the use of heavier yarn and the resultant coarseness of the material. No wool weaving yarns are found in this group.

Single-ply and two-ply yarns are as 20 to 16 among the Late-period gauzes available, but there is also a Chancay gauze (UC 16-1181) with two-ply warps interlaced by single-ply weft, and in an Ica gauze (UC 16-1499) the reverse is true. The amount of twisting shown by the yarns in these Late pieces varies from medium through hard twist, the usual crepe, and tight crepe of the degree that kinks and curls on itself. Two dark blue gauzes in a Lima museum (MA 2617 and a specimen without number) are woven with wool yarns, one of two-ply, the other of single-ply yarns.

The direction of the yarn spiral, whether upward to the right (the Z twist) or upward to the left (the S twist), has an influence upon the surface appearance of a gauze. If it is woven of warps and wefts both spiraling in the same direction, the surface is less pebbly than if one system of yarns is right-, the other left-spiraled. The information at hand is too meager to warrant a generalization that the ancient gauze weavers considered this latter possibility. Of the 21 Middle-period gauzes, most of them from Supe sites, 16 of the warp systems are left-spiraled, 4 are right-spiraled, and one specimen (UC 4-7481i) has warps of both types. The weft systems of these same textiles are interesting, but are too varied to form a basis for conclusions. The left-spiraled weft systems total 12, the right-spiraled weft systems 2, and in 7 of the systems both S-twist and Z-twist yarns appear. It may be that the combination represents the yarn output of different spinners. The usual method of forming two-ply yarns is by twisting the singles together in the direction counter to that used for the spinning of the individual strands. For example, two left-spiraled singles are combined to form a two-ply yarn spiraling to the right.

There are no gauzes in the entire lot that are woven of both cotton and wool yarns. The unions that do occur are results of superstructural techniques such as brocading and embroidery in wools, or of wool tapes applied to the edges to give added decoration. Composite materials of this character are briefly described in the section "Supplementary Techniques."

THE LOOM AND THE WEB

As yet there is no standard study on ancient Peruvian looms or weaving tools. An archaeologist connected with a Lima museum once said in conversation that he thought it unlikely that large frames or comparable equipment would be found, because (1) these objects would take up too much room in the grave, and (2) they may have had little sentimental or other value in the eyes of the ancients. There are undoubtedly some pieces extant, however, which might contribute to a fuller understanding of procedures.

There are a fairly large number of narrow looms in our museums, many of them with partly completed weavings still bound to loom bars. The most plentiful evidence testifies to the widespread use of the backstrap or stick loom, a type which is still in use among weavers from the Southwest to the Andean regions.

As far back as the period of the Paracas Caverns the Peruvian loom had a stick heddle with pendent loops;¹⁶ it also had a shed roll. By one or the other of these two fundamental devices either the odd-numbered half or the even-numbered half of warp threads could be raised as a unit.

The essential parts of the stick or backstrap loom are the same, from whatever area they are reported:

1. The upper bar or end stick, usually with cords by which to attach the loom to a stake, tree, or house post.
2. The lower bar or end stick, with cords extending to a belt or backstrap. The weaver sitting within the arc formed by these belt cords could vary the tension placed upon the warps bound in position between the bars by changing the position of her body.
3. The shed roll or stick, over which pass alternate warps separating the web into an upper and a lower plane of warps. We have arbitrarily considered the odd-numbered warps as constituting the upper plane.
4. The heddle stick with pendent loops each of which encircles an alternate warp. In this study the heddle-controlled warps are the even-numbered warps, those constituting the lower plane.
5. The weave sword or batten, with which each line of weft is pressed down to the working edge of the fabric.
6. The bobbin stick carrying the weft yarn through the space (shed) created by drawing forward the shed roll or by raising the heddle stick with its loops.

LOOMSTRING WEFTS

The threads at the extreme ends of a cloth woven on a backstrap loom generally differ in size, formation, or number from those in the body of the weaving. These first wefts put across are called the loomstrings. If the weaving is to come to the very end of the warps to form an end selvage (pl. 14), the weaver binds the first loomstring weft to one end bar and weaves a heading strip. She puts another loomstring through at the opposite end of the web and binds this to the second bar. Besides thus making possible the binding between web and

¹⁶ Textile Periods II, 151.

loom, the loomstrings establish the predetermined width of the finished cloth. They also secure the warps in their separate positions and serve as a desirable check on the width of the fabric while it is being made. Loomstrings may be used for this purpose, even when they are placed at some distance from the end loops of the warp. The fringe loops in plate 18, *b* were probably formed upon the withdrawal of a small stick, which took the place of the usual first loom-string weft.

In handling the allover gauzes one marvels at the skill with which the warps were kept spaced and in order. None of the fragile cloths can now safely be extended to its original dimensions, but it should be remembered that all of them were held under tension while the cloth was being woven.

Among our allover gauzes there are no oversized cords of the type employed as loomstrings at the ends of closely woven materials, especially of the tapestries. A Middle-period specimen (UC 16-1675) has loomstrings of two-ply yarn carried across twice; at the end of a second breadth the loomstring weft is a single-ply yarn; a second Middle-period specimen (UC 4-7481d) has three picks of two-ply string. In a random sample of a dozen unselected pieces the number of small single-ply yarns treated as one but not spun together varies. Sometimes these are carried across the web twice, sometimes three times; several cloths show both methods of beginning the heading strip. Examples of paired single plies used as loomstrings are found in Middle- and Late-period cloths. Two of the former are shown in plates 5, *d* and 18, *b*. Several Ancon and Chancay cloths have intact loomstring ends; a good example is shown in plate 9, *a*. Three single plies used as one make the loomstrings for the cloth in plate 11, *b*; three single plies as one carried back and forth four times make the loom-string selvage in an Ancon piece (UC 16-1092). As may be noted, all are small and seem ineffective.

There is one unusual example of a soft-twisted loomstring formed of four two-ply red wool yarns which is carried across twice to make the end selvage of the textile: 6, *c*. These two picks are followed by a half-inch heading strip, also in wool.

SIDE SELVAGES

The ancient Peruvian weaver did not think it necessary to reinforce the side selvages of her work. Many present-day weavers on backstrap looms have the same attitude. In view of this fact, possible exceptions to this generalization have technical interest.

Several Middle-period Supe gauzes have an effective treatment of the side edges which differs from that found on most cloths from other coastal sites (pl. 13, *c*). The reason for the procedure, which results in a kind of plaiting such as one finds on basketry or mats, is not clear. In the Supe cloths, the weft was wound on three bobbins. Each was put across from one side edge to the other, but was not returned until all three had been put across. Thus weft 1 entered from the right, say, and recrossed as weft 4 from the left. Weft 2 entered from the left and recrossed as weft 5 from the right; weft 3 entered from the right and recrossed as weft 6 from the left. Repeats are in the same sequence. The plaited edge results from an unbroken sequence of under, over, under, and so

on, whether the weft is passing through the warp plane or interlacing with the other two wefts along the edge. This can best be seen in the reconstruction (pl. 22, b).

A second edge treatment comparable to a selvage occurs on the embroidered cotton gauze in plate 6, c. Red wool yarns make stripes one inch wide on one edge, about half that width on the other. The warps are set unusually close, as compared with those in the body of the textile: approximately 72 wool warps per inch as against 22 cotton warps for the gauze. These decorative, or strengthening, edges are in the class with true selvages.

JOINS

When weaving has progressed to a point near the heading strip at the upper loom bar, the weaver must consider uniting the two sections. Contemporary stick-loom weavers have various standard and individual methods of achieving a join which shall be as nearly invisible as possible. If the cloth is merely for use, no special concern is felt when the connecting area is looser in texture and less well woven, but the ancient Peruvians were extraordinarily successful even with cloths of this general type.

One cannot be certain that the end section in plate 11, b shows the join, although it appears to. On the whole, the cloth is not poorly woven, but this end section has a slanting working edge and just such irregularities as are caused by uneven or ineffective battening. Comparison of the first inch with the remainder of the plain-weave end section reveals changes in texture. These characterize the sections in which the joins are made. The cloth in plate 16, a has a section of weaving (not shown) in which the weaving is noticeably coarser than that in the main body of the web. The thread count supports our supposition that the join was made in this section: 18 warps by 32 wefts per inch change to 18 warps by 16 wefts.

There is one indication of a join in the section of the Ica kerchief illustrated in plate 14. About one-half inch down from the edge the wefting changes to single, by contrast with the paired wefts in the rest of the plain-weave heading strip. The quality of workmanship is so fine that the join, if it is one, is invisible to casual observation.

GAUZE TYPES AND WEAVING PROCEDURES

Gauze weaving as the ancient Peruvians developed it required a high degree of skill, imagination, and knowledge of materials. The weave itself differs from other warp-weft techniques in that its warp elements are deflected from their normally parallel positions to cross and recross adjacent or neighboring warps. The crosses so formed are held by lines or picks of the weft yarn in its passage from side edge to side edge of the fabric.

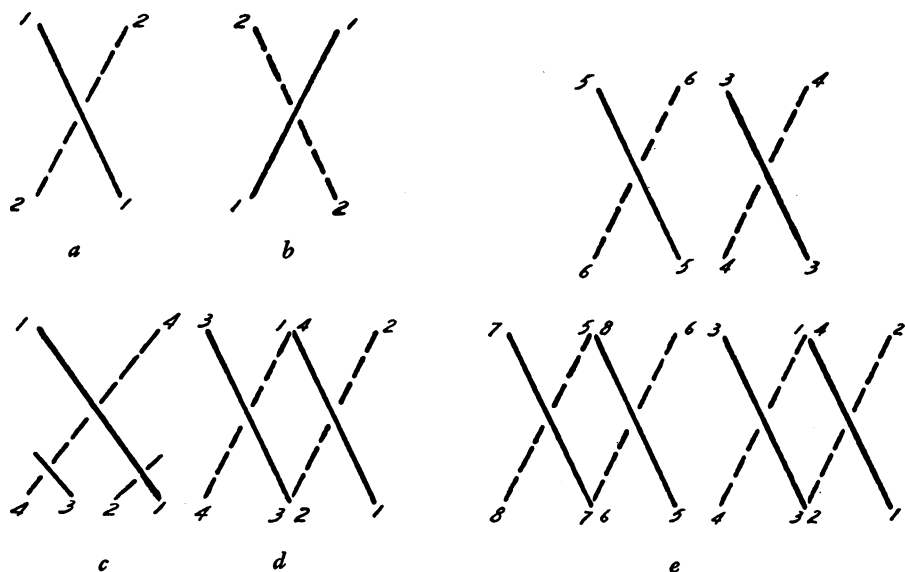


Fig. 2. Basic gauze units: *a*, active warp 1 crossing passive warp 2 as in Type I. *b*, active warp 1 returned to original position. *c*, active warp 1 crossing passive warp 4 as in Types II and II, A. *d*, active pair 1 and 3 crossing passive pair 2 and 4 as in Types III and IV. *e*, same as *d* with redivision of warps to form new units of four as in Type IV and variants.

Modern gauze weaves are customarily classified as plain and fancy gauzes. In a plain gauze, "one or more warp threads regularly cross over an equal number of adjoining warps before the insertion of a line of weft and then cross back again before the next line of weft."¹⁷ Fancy gauzes include all digressions from the normal order of regularly crossing adjacent warps. Most Peruvian cloths woven wholly in gauze technique or with openwork patterning fall within this so-called fancy group. They are often elaborate and exhibit skillful interlacings of the weaving elements.

Technical analyses of the Late-period gauzes in the University of California collections called for reconstructions of these several forms of interlacing. Manipulation of the threads in producing these patterns proved that any active warp once carried from its original position to cross a passive warp must at some point come back to a position parallel to its neighbors. Irrespective of the seeming complexity of the pattern motives, the active warps were deflected from their places and then moved back to them in a regular sequence.

¹⁷ Reath and Sachs, *Persian Textiles*, p. 64.

A few technically simple permutations of the basic gauze units shown in figure 2 sufficed for decorative bands and allover patterning. By recombining the elements of these techniques the Peruvians executed the remarkable design motives in the more elaborate webs. Our simple gauzes include the plain gauze and others similar to it in construction; and our composites vary with the elements of which they are assembled. The types for which we have examples are as follows:

- Type I, simple gauze (pl. 3, *a*)
- Type II, simple gauze (pl. 3, *b*)
- Type II, variant A (pl. 3, *c*)
- Type III, composite gauze (pl. 4, *a*)
- Type IV, composite gauze (pl. 4, *b* and *c*)
- Type IV, variant A (pl. 4, *e*)
- Type IV, variant B (pl. 5, *a-c*)
- Type IV, aberrant (?) (pl. 4, *d*)
- Type V, composite gauze (pl. 5, *d* and *e*)

A description of each gauze type, including variants, is given below. Although the sixty-odd analyzed specimens constitute a random sampling of Peruvian gauzes as a whole, most of the illustrations in the literature correspond in technique to one or more of our cloths. Table 5 lists plate and figure numbers of gauze-woven fabrics found in some of the principal sources. Among Schmidt's¹⁸ ninety-odd illustrated textiles there are no gauzes.

It was found not only possible, but practicable, to duplicate our gauze types on a setup of warps equipped with two warp controls: shed roll and heddle stick with pendent loops. If these fundamental aids were actually all the ancient gauze weavers had—we shall not know until we discover unfinished webs on their looms,—certain fine gauzes like those in plates 5, *d* and 9, *a* must represent thousands of tediously repeated movements of the fingers. But to begin to understand the forces of convention behind a Peruvian style we have only to recall the monotonous stitch-by-stitch development of the embroideries on hundreds of retrieved Paracas Necropolis garments. Apparently time was never of the essence in ancient Peru.

In addition to the reconstructions of techniques made with heavy threads, we present in the Appendix a series of warp-grouping diagrams (A-L) accompanied by an outline of the necessary steps in the weaving procedure.

Type I, simple gauze; single warps cross and recross one-over-one to form vertical bars (pl. 3, *a*).

In plain gauze of this elementary character, adjacent single active warps (our odd-numbered warps) cross or recross before each line of weft yarn. If only the adjoining warps are crossed, the pairs form vertical bars with wefts rather widely spaced by the crossings. In a loosely woven cloth there is a tendency for the warps to pull and twist, but this type of gauze construction can produce a firm, closely woven web (pls. 6, *c*; 7, *a*).

To judge by its infrequent occurrence, the ancient weavers were seldom content with allover vertical-line gauze. Only two of the textiles in the lot, possibly

¹⁸ Max Schmidt, *Kunst und Kultur von Peru* (Berlin, 1929).

scarves or head veils (UC 4-5883, 4-6725), are predominantly of this type. All the others are combinations of plain gauze and contrasting textures. The majority of these include the plain weave in one of its forms:

Plain gauze and muslin-like textures as in plates 6, *b*; 8, *a*; 11, *a*, and MA 2617.

Plain gauze and basket-weave types of fabric as in UC 16-2117 from Ancon.

Plain gauze with tapestry-woven borders as in plate 6, *c* from Supe, or crossbands as in MHN 2942 from an unknown site.

A plain allover gauze fabric was especially useful as a ground material for embroidery because the open spaces in the gauze made a convenient gauge for the lengths of stitches. The Italian name current in the seventeenth century, *buratto*, is still applied to this combination of techniques. Plates 6, *c* and 7, *a* show two styles: the base material in the first is nearly hidden by the embroidery; that in the second is visible and contrasts with the colors of the wools. A third example (fig. 8, *a*) is similar to the first.

Chancay material cross-banded with lines of plain gauze is the ground for the design applied by a resist process (pl. 8, *a*).

Type II, simple gauze; single warps cross and recross one-over-one to form an allover of lozenge meshes (pl. 3, *b*).

Type II is similar to Type I gauze in that single yarns cross each other. It differs from plain gauze in that the deflection of the warp threads from their normal positions produces four-sided lozenge openings as a result of the method of interlacing individual warps.

Gauze weaving of this type is monotonous, and certainly was a tedious task. Its chief difficulty is inescapable, from fineness of the yarns; but that this was not permitted to hamper seriously the efforts of the ancient weavers would seem evident from the quantities of gauzes and other fine-yarn fabrics produced in Early, Middle, and Late periods.

Type II gauze is found in combination with other forms (pl. 19, *b*), and as the sole type in a fabric, also. A light brown Chancay mantle is represented by a section in plate 9, *a*. The filmy, unpatterned material is now very fragile, but the size of the rectangle (93 in. by 53 in.), with its ornamental border to give it weight, indicates that enveloping garments of this style had a place among the sturdier articles of wear. UC 16-1638 is a second allover gauze of the same type, likewise unpatterned.

Type II, variant A, simple gauze; single warps cross one-over-one to form sections of allover lozenge meshes alternating with oval openings spanned by basic wefts (pl. 3, *c*).

Four Late-period specimens quite similar in quality and style exemplify Type II, A. All are lacelike and sheer. The Chancay cloth (pl. 10, *b*), is woven of beautifully spun dark brown yarns; a second Chancay fragment (UC 16-1643), also filmy, is lighter brown; the Ancon gauze after which the reconstruction was made (pl. 10, *a*) is white, as is likewise a Huacho specimen (pl. 9, *b*).

The patterns resulting from this method of weaving gauzes testify to the creative ability of the Peruvians. Through reconstructing the technique we discovered that omissions at regular intervals of the ordered crossings of those

warp threads in the rows which were picked in by hand formed the oval openings. Only the crepe-twisted wefts span the ovals, which in our fabrics follow the outlines of allover zigzag patterns.

Type III, composite of gauze and plain-weave techniques; pairs of odd-numbered warps cross pairs of even-numbered warps, forming vertical bars; alternate wefts weave over-one-under-one as in plain cloth (pl. 4, *a*).

The quality of the weaving yarns changes the appearance of fabrics in the Type III group. The Hualal Viejo cloth (pl. 11, *b*) is a sleazy piece in spite of the several picks of plain weaving between the gauze units; a fragmentary Ica cloth reconstructed for plate 4, *a* is firm and smooth as muslin. In this specimen the repeated gauze bands resemble needle-made drawn work.

The simplest use of Type III gauze in our collection serves merely to make short courses of openings in a fabric from Majoro (fig. 1), an Early-period site.

Among our gauzes, all the specimens in which the unit comprises four warps show a division into active and passive pairs on the basis of odd- and even-numbered warps. This division is in contrast to a line drawing in D'Harcourt¹⁹ in which a pair consists of two adjoining warps. According to the drawing, active warps 1 and 2 cross passive warps 3 and 4, a procedure followed by some contemporary hand weavers and by most weavers on mechanized looms. The degree of compactness in cloths so woven is noticeably greater than that characterizing the Peruvian fabrics. Obviously, vertical bars resulting from the use of four warps are heavier in appearance than those made with two warps, although there is a strong similarity between Types I and III.

Type IV, composite gauze; combines elements of Types I and III to form herringbone crossbands or an allover of lozenge meshes (pl. 4, *b* and *c*).

For some time the senior author has called this form "Peruvian" gauze, chiefly because it is the one most frequently encountered in the collections from various sites and from all known periods. Like some other designations of its kind, the term has proved unsatisfactory: weavers in Mexico and highland Guatemala are thoroughly familiar with the technique and appreciate its pattern possibilities.

Webs woven with the Type IV gauze technique are open and often lacelike in appearance, with small diamond or honeycomb meshes. Some fabrics are allover gauze, but variations within the technique are possible, besides effective combinations with other techniques, especially the plain cloth weaves.

Our specimens include numerous examples of Type IV gauzes. All but one of the Early-period cloths from the Nazca Valley and Paracas Caverns sites fall in this category. The two from Cahuachi, one of them shown in plate 12, *a*, have gauze pattern units on plain-weave ground. The Caverns patterns are much more elaborately conceived, with correspondingly smaller areas of plain weaving. The texture of one of these is shown in plate 12, *b* and *c*. The complete pattern was drawn for figure 6 of Textile Periods, II.

Fourteen of the Middle-period cloths have patterns developed solely in Type IV gauze (see pl. 13, *a-c* for general style), or they have crossbands in this type combined with those developed by other methods.

¹⁹ D'Harcourt, *Les Textiles anciens du Pérou*, fig. 32, B.

Late-period gauzes make less use of Type IV as a technique for pattern motives, although it frequently appears in crossbands and allover effects. In its simplest form the bands are narrow, approximately a quarter of an inch wide in the decorative portion of two white shirts from an unknown provenience (MA 2586, 2587) and about that same distance apart. The narrow bands are usually in herringbone or half-lozenge patterns, as shown by brown-and-white Ica "ginghams" (pl. 15, *b*), by borders edging principal pattern bands (pl. 17, *b*), and by trios of bands alternating with wider brocaded sections (pl. 14).

Quite different from this style of gauze-woven decoration is that of the Chanchan specimen (pl. 16, *d*). In appearance Type IV gauze forms the sheer lacy ground upon which are embroidered (or brocaded?) heavy-textured step-fret motives. In reality, as the reconstruction shows (pl. 16, *c*), areas of plain weave corresponding to the size and shape of the motives have been provided as ground material for the ornamentation. In its original condition this piece must have excited admiration even among fellow craftsmen.

Type IV, variant A, composite gauze; combines elements of types I and III; sections of allover gauze alternate with oval openings spanned by basic wefts (pl. 4, *e*).

Three fragile cloths from Late-period sites, almost the same in patterning as the one in plate 15, *a*, exemplify a variation achieved by methods comparable to those used in weaving Type II, A (pl. 10, *a*). The Type IV, A result gives the impression of being very intricate, but it represents merely an interruption of the regular order of warp interlockings which are necessary in the weaving of Type IV allover. The regularly spaced oval openings required a preconceived plan and some calculation, but once they were worked out a number of combinations might have been possible.

Type IV, variant B, composite gauze and plain-weave techniques; pairs (or trios or fours) of odd-numbered warps cross pairs (or trios or fours) of even-numbered warps to form herringbone bands or an allover of lozenge meshes; single wefts securing the crossings alternate with a group of several—usually three, five, or seven—plain-weave wefts (pl. 5, *a-c*).

The difference in appearance between variant B and Type IV, designated as the principal type, is obvious. In some cloths (pl. 22, *d*) the herringbone effect is pronounced; in others, carelessness in regrouping for the second series of crossings blurs the effect (cf. the upper and lower pairs of gauze crossings in pl. 18, *a*).

Cloths in which Type IV, B appears for the purpose of forming the design motives are shown in plate 18, *b-d* of Middle-period textiles, and in plate 17, *b* and figure 11, *d* and *e*, all of the two-odds-over-two-evens variety; in figures 10, *b* and 11, *b*, of the three-over-three variety; and in figure 12, *b*, of the four-over-four variety.

Three Late-period cloths employ Type IV, B gauze more extensively. Plate 5, *c* is a reconstruction of a large fabric in advanced stages of disintegration. Its allover pattern of crosswise bands contrasts with the rarely used half basket weave of the plain bands. The cloth in plate 20, *b* is also fairly heavy, but as a result of crossing four odd over four even warps. The effect is similar

to that of drawn work done with the needle. The long narrow scarf, "Peru" 1675, is similar to the reconstruction in plate 17, *a*. It has a patterned border and a central decorative band of interlocking serpent forms and scroll-like motives in gauze against a plain-weave ground.

A gauze form resembling Type IV in a single specimen, Ancon 16-2118, owes its slightly different appearance to an omission of one line of warp crossings (pl. 4, *d*).

The herringbone or half lozenge is developed by two lines of weft. The conspicuous distinctions between this possibly aberrant specimen and all but one other gauze in our collection lies in the fact that the principal crossings are made not only prior to the passage of the weft thread from the right edge to the left, but prior also to its return from the left edge to the right. This rare

TABLE 4
FREQUENCIES OF GAUZE TYPES

Period	No. of pieces	Total no. of occurrences	Types								
			I	II	II A	III	IV	IV A	IV B	IV AB	V
Early...	7	7	..	..	..	1	6	..	..	..	..
Middle..	21	23	4	..	..	1	13	..	4	..	1
Late....	39	43	9	3	4	2	10	3	11	1	..
All....	67	73	13	3	4	4	29	3	15	1	1

procedure brought about two other distinctions: principal crossings were made not only by odd-numbered active warps (warps that move over others), as in other gauzes, but also by even-numbered active warps. Very probably, too, both hands were adept in the same movements.

Whether the unusual manipulations necessary to develop this gauze were, in this specimen, deliberately undertaken for the sake of an almost imperceptible modification of the effect, or whether they were undertaken to save time, can only be conjectured. Yards of virtually invisible embroidery in complicated techniques edge the Paracas Necropolis garments; recollection of this edging (about nine yards each for many of the mantles) discourages "logical" explanations for what we find in ancient Peruvian textiles.

Type V, composite gauze; combines elements of Types II and IV to form an allover of lozenge meshes (pl. 5, *d* and *e*).

This Middle-period fragment of dark blue cotton from Huaral Viejo is the most complicated gauze in our entire group. The piece is cross-banded with narrow sections of plain weave battened like tapestry. Between these are woven sections of allover gauze. Several of these are in Type IV gauze, which presents no new features; one wide section, shown in the enlargement in plate 5, *e*, is in the same class with the aberrant (?) Type IV in that the principal crossings are made prior to the right-to-left passage of the weft thread and also on its return from the left. Although the general effect of the mesh is similar to one made by the Type II method, Type V appears to demand more effort, and one can only guess what influenced its choice.

TABLE 5
TYPE CLASSIFICATION OF SPECIMENS ILLUSTRATED BY OTHER AUTHORS

	Crawford ^a	D'Harcourt ^b	Means ^c	Means ^d	Reiss & Stübel ^e
Type I.....	Fig. 21 Fig. 22 Fig. 24 Fig. 28	Fig. 29A, b Pl. 10, 4 Pl. 11, 1-2 Pl. 32, 1 Pl. 33, 1 Pl. 35, 1 Pl. 37 Pl. 44, 2	Fig. 203	Fig. 73 Fig. 74	Pl. 70, 4 Pl. 70a, 1 Pl. 71, 1
Type II.....		Fig. 29A, c Pl. 32, 2 Pl. 34 Pl. 35, 1 Pl. 36, 1 Pl. 37 Pl. 49, 1			
Type II, A.....		Fig. 30, b Pl. 33, 1-2	Fig. 201		
Type III.....		Fig. 32, B Pl. 38, 2 Pl. 72, 4-5			Pl. 71, 3
Type IV.....		Pl. 32, 2 Pl. 34 Pl. 36, 1 Pl. 38, 2			Pl. 70, 5-6
Type IV, A.....					
Type IV, B.....	Fig. 23	Fig. 32, B Pl. 35, 2 Pl. 36, 2 Pl. 38, 1			Pl. 70a, 2 Pl. 71, 2 Pl. 71, 5
Type V.....					

^a M. D. C. Crawford, *Peruvian Fabrics*, AMNH-AP 12 (1916): 105-191.

^b Raoul d'Harcourt, *Les Textiles anciens du Pérou et leurs techniques*, Paris, 1934.

^c P. A. Means, *Ancient Civilizations of the Andes*, New York, 1931.

^d P. A. Means, *A Study of Peruvian Textiles in the Museum of Fine Arts*, Boston, 1932.

^e W. Reiss and A. Stübel, *The Necropolis of Ancon in Peru*, Berlin, 1880-1337.

This specimen is the only piece which gives the impression that a skilled craftsman may have played with techniques. In other gauzes, the weaver depended upon one or another of the shedding devices to cause the necessary deflection of warp threads for half the rows of weft. In the Huaral Viejo fragment the fingers managed the crossings of warp threads for two rows of weft out of three. This meant slower progress than in the weaving of other gauze types.

Four cloths in the collection are patterned in more than one gauze type. Plate 17, *b* shows a wide decorative border of Type IV, B gauze flanked on either side with narrow bands of Type IV. An Ancon piece, after which the reconstruction in plate 20, *a* was made, has a combination of Type IV gauze in the patterned section and a border of crossbands in which the gauze is an abbreviated version of Type IV or possibly an aberrant type. We list it under the latter.

Plate 20, *b* and its reconstruction detail (pl. 20, *c*) illustrate three gauze types: Type III at the beginning or ending of the more open crossbands; Type IV B gauze for the crossbands themselves; and Type IV, the most typical of the Peruvian gauze techniques. This last forms the crossbands with smaller meshes.

A dark blue Middle-period fragment from Huaral Viejo is technically the most complicated in our lot. The weaver made use of the simplest of all gauzes, Type I, in order to get the warps in position for the allover which we call Type V. Flanking the bands in this technique are compact plain-weave crossbands and beyond them the standard Type IV.

To sum up, the frequencies of the gauze types found among our textiles from the three represented periods are as given in table 4. Since several pieces combine two or more types in their patterning, the total occurrences outnumber the total number of 67 specimens.

THREAD COUNTS

The number of warps and wefts per unit of measurement is frequently cited to indicate the quality of a fabric, but in reality the quality varies with the class of woven material. Compactness alone is not a reliable criterion of excellence. It may apply to certain types of weavings—tapestries, for example,—but sheerness as achieved in the gauzes through the use of fine yarns deliberately spaced requires a totally different criterion. Hence the relative value of thread counts as evidence of standards.

The purpose in our directing attention to thread counts is to emphasize the usefulness of the gauze technique as a means of ornamenting fabrics of markedly different textures. The Early- and Middle-period examples can be treated as two groups within each of which the individual cloths have strong similarities. The Late-period specimens display, as in other aspects already noted, greater variations in textures. The thread counts reflect them. All our counts were taken as the cloths lay flat, not extended at loom tension.

The scatter diagram (fig. 3) records the counts of one wool and six cotton cloths from Early-period sites. The small fragments of a Paracas Caverns gauze (pl. 12, *b* and *c*) are characteristic of the cotton weavings. Warp counts range between 26 and 30 per inch; weft counts, between 24 and 28 per inch. Plate 12, *a* (count 30 by 24) is a combination of the finest-set warp system and the coarsest-set weft system among the six. Not only is the range unusually limited, but four of the six cottons have square counts and balanced warps and wefts, and the other three cloths have virtually these same characteristics. The wool specimen is the finest of the lot.

The Middle-period group totals twenty-one pieces, of which three fragments are all gauze. The counts entered in the scatter diagram (fig. 3) are for the plain-weave end sections of the remaining eighteen. The warp counts represent a fairly wide range, but the concentration is apparent from the following series, in which the numbers in parentheses indicate the number of occurrences: 22 warps per inch (1), 36 (4), 38 (2), 40 (3), 42 (3), 44 (2), 46 (2), 50 (1). The weft count has an even wider range, but the preponderance is approximately the same as for the warps, between 36 and 40 warps per inch: 26 (1), 30 (3), 32 (2), 34 (3), 36 (1), 38 (2), 40 (4), 44 (1), 52 (1).

The Supe cloths in this group are woven by such methods as to require separately taken thread counts on the gauze-patterned sections. The reason is clear from plate 13, *c*. The count for the plain-weave end sections is 36 single warps by 36 single wefts per inch. At the beginning of the patterned section the variety of plain weave changes to what might be called a half basket weave. Here the texture of the background gives the impression of being the same as that of the end sections; but actually the wefts are in pairs. It is not easy to see a reason for the change to pairs, yet eleven of the twelve fabrics of this style are woven in this way. Very often, too, the warp counts in the gauze sections change from those in the end sections, owing to great difference in manipulation of the elements. The tabulation with counts in order from coarse to fine brings out all these points.

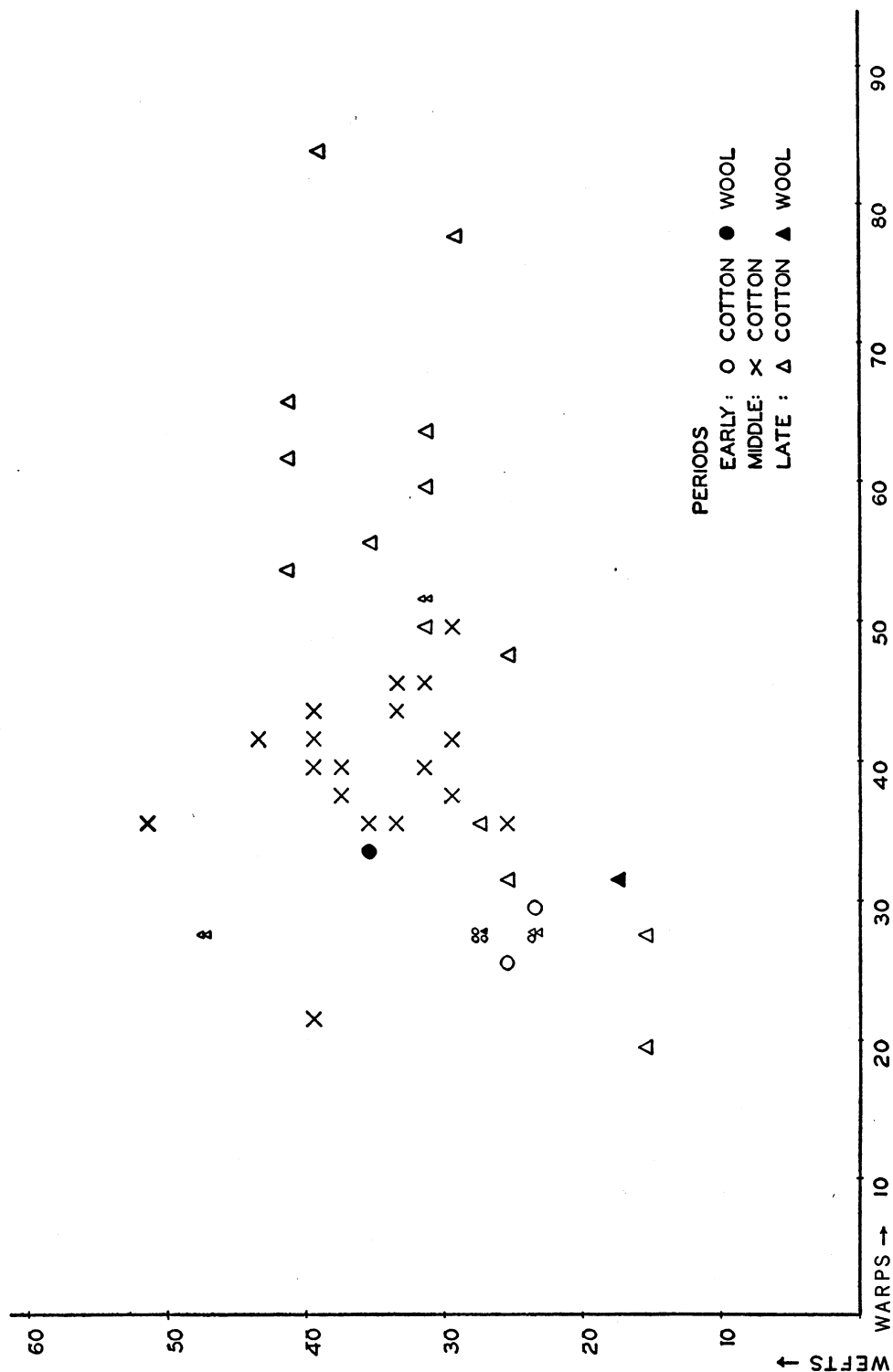


Fig. 3. Scatter diagram showing thread counts for Early, Middle, and Late gauzes. Open symbols indicate cotton; solid symbols indicate wool.

Only twice does the number of pairs in the patterned sections equal the number of single wefts in the plain end sections, although the count of individual yarns is much higher in the first. For example, the even-textured cloth in plate 13, *b* has 30 weft pairs (60 single wefts) per inch in the gauze sections as against 52 single wefts in the plain sections, a difference of eight wefts per inch. Other thread counts reveal much greater inequalities between the two sets of wefts. The differences range through 18, 22, 24, 26 (2 specimens), 32 (3 specimens), 36 in other fabrics.

The full list is given in the following tabulation:

Specimen no.	Plate no.	Count, plain-weave section (singles)	Count, gauze-patterned section (singles by pairs)
UC 4-7481a.....	....	36 by 34	Missing
UC 4-7152.....	13, <i>c</i>	36 by 36	38 by 36
UC 4-7481d.....	13, <i>b</i>	36 by 52	38 by 30
UC 4-7481f.....	....	38 by 30	40 by 28
UC 4-7481h.....	....	38 by 38	40 by 28
UC 4-7481i.....	....	40 by 32	40 by 32
UC 4-7481e.....	....	40 by 38	40 by 30
UC 4-7481k.....	13, <i>a</i>	40 by 40	42 by 36
UC 4-7481b.....	....	42 by 40	44 by 32
UC 4-7481g.....	....	44 by 34	42 by 30
UC 4-7481c.....	....	46 by 32	46 by 32
UC 4-7481j.....	....	Missing	42 by 34

The thirty-nine specimens from the Late period may be grouped under three categories. One of these, represented by more than a fourth of the cloths, has negligible heading strips of plain weave at each end of the web. The rest is virtually all gauze. The counts taken on this lot, beginning with the lowest warp count, are as follows:

Specimen no.	Plate no.	Count, gauze allover (singles)
UC 16-1638.....	....	10 by 6
UC 4-6725.....	....	12 by 13
UC 16-6866b.....	16, <i>d</i>	16 by 12
UC 16-1649.....	....	16 by 26
UC 16-1092.....	....	18 by 22
UC 16-1081.....	9, <i>a</i>	28 by 10
UC 4-5883.....	....	34 by 14
UC 16-988.....	7, <i>a</i>	40 by 16
UC 16-1643.....	....	40 by 32
UC 16-1635.....	15, <i>a</i>	46 by 20
MA 3141.....	....	Missing

A second category comprises seven of the Late-period gauzes. In these, plain weaving appears only in the form of narrow bands from $\frac{1}{4}$ inch to $\frac{1}{2}$ inch wide. Some of these are close-battened as in tapestry textures. The thread

- * counts per inch are based on those of the bands. The median for both the preceding and this series is about 28 warps per inch.

Specimen no.	Plate no.	Count, plain-weave bands
UC 16-1650.....	16, <i>a</i>	18 pairs by 40 pairs
UC 16-971.....	20, <i>b</i>	20 pairs by 112 pairs
UC 16-2117.....	....	22 singles by 32 pairs
UC 16-1093.....	10, <i>b</i>	24 singles by 16 singles
UC 16-978.....	19, <i>b</i>	32 singles by 68 singles
UC 16-972.....	10, <i>a</i>	38 singles by 32 singles
UC 16-2016.....	8, <i>a</i>	56 singles by 36 singles

Twenty of the thirty-nine specimens in the Late-period group are entered on the scatter diagram. The majority are woven of single yarns in both systems, but wefts are paired in a few specimens and both warps and wefts are paired in the basket weave in plate 14. On the diagram these paired elements are treated as units and entered as single yarns.

By comparison with the two smaller series, this lot has a wide range of thread counts in its plain-weave sections: warps from 20 to 84 per inch; wefts from 16 to 42. There are two concentrations, the smaller of them comparable to that of the Early-period cloths, the larger with thread counts indicating finer textures than those of the Middle-period cloths. The counts for the latter group begin with 48 warps and end with 84. The warps are preponderant in more than the usual number of cloths.

Specimen no.	Plate no.	Count, plain-weave section (singles by singles except where otherwise indicated)
UC 16-1637a.....	17, <i>b</i>	20 by 16
MHN 1349.....	....	28 by 16
MA no number (wool) .....	....	28 by 28
UC 4-6408d.....	22, <i>d</i>	28 singles by 24 pairs
UC 16-1181.....	....	28 singles by 24 pairs
UC 16-2617 (wool).....	....	32 by 18
UC 4-4991.....	14	32 pairs by 26 pairs
UC 16-2118.....	....	36 by 28
MHN 6225a.....	....	48 by 26
UC 4-5473g.....	....	50 by 32
MHN 2445.....	....	52 by 32
MHN 2942.....	....	52 singles by 32 pairs
UC 16-973.....	18, <i>a</i>	54 by 42
UC 16-1499.....	....	56 by 36
MHN 2429.....	....	60 by 32
MA 2587.....	....	62 by 42
MHN 2440.....	....	64 by 32
MA 2586.....	....	66 by 42
UC 4-5473e.....	15, <i>b</i>	78 by 30
MHN 2439.....	....	84 by 40

SUPPLEMENTARY TECHNIQUES

In this study the term "allover gauze" applies to cloths in which not only the main patterning, but virtually the entire fabric, is gauze. The Huacho veil in plate 9, *b* is a good example. There is some plain cloth weaving in the form of a heading strip at the ends of each gauze breadth, often so narrow as to be invisible as such; but this is a technical requirement and no part of the pattern plan. Allover gauzes falling within our category total eleven; all except one Paracas Caverns example (pl. 12, *b* and *c*) are from Late-period sites.

The fifty-six gauzes outside the allover category combine several techniques in the same piece or add decorative borders in which they occur. Most of the processes in the fairly short list present no surprises, but at least two of the gauze fabrics corrected the first impression that gauze weavers—unlike others in ancient Peru—were content with a few supplementary techniques. Nothing in the Early-period or Middle-period lots, for example, prepared us for the series of very small fragments which revealed a few traces of end-to-end warp interlocking (pl. 22, *a*). The process resulting in what have been termed multi-colored patchworks was well known to the Early Nazca weavers and to the weavers of Middle-period Supe.²⁰ In the Ica specimen there is not the slightest clue to the kind of fabric or patterning produced on the added warps. All we can surmise from the uniform texture of the extant fragments is that it was done by a skillful weaver. This interest in combining a variety of techniques and the ability to execute them with the same degree of proficiency and taste have resulted in some of the most startling fabrics in the history of textiles.

To cite a second specimen unique in the lot: the resist-dyed fragment in plate 8, *a* and *b* certainly represents surprising treatment for a gauze-woven fabric. Fuller description is given this piece under the heading "Applied Color."

Table 6 lists the warp-weft techniques supplementing the gauze types occurring in the collection. The plain-weave examples are of two kinds: one represents cloths like plate 18, *a*, in which the plain garment material is decorated with gauze-woven bands; the second kind is exemplified in plates 11, *b*; 12, *a*; and 14, in which the plain weave is incidental or, at most, forms a contrasting texture field for the motives.

As pointed out in the section on yarns, almost all those used in weaving are single-ply cottons. The use of two singles on the bobbin at the same time characterizes gauzes of Middle and Late periods, especially the Middle. To judge by the textures of the materials from Supe, gauzes were woven for ordinary wear (pl. 13, *a-c*). Plate 13, *c* shows the change-over from a plain end section woven with a single weft to a patterned section woven with twin singles. In these gauzes it appears to have been desirable to produce texture contrasts between the open pattern motives and the field against which they showed. The method of achieving this result may be seen in the partly dissected lower edge in plate 13, *a*.

The weaving procedure is unusual, but it is still followed by present-day weavers on backstrap looms as a method of straightening the working edge.²¹

²⁰ L. M. O'Neale, *A Peruvian Multicolored Patchwork*, A.A., n.s., 35 (1933): 87-94.

²¹ L. M. O'Neale, *Textiles of Highland Guatemala* (Washington, D.C., 1946), p. 49.

The weavers in some country districts of Spain also use the "weft turn-back" to produce pattern.²²

In the Supe gauze weavings, the odd-numbered twin wefts followed one routine, and the even-numbered twin wefts followed a quite different one. Let us suppose that the odds crossed the web from right selvage to left selvage; they crossed like any plain-weave weft. The evens, crossing from left to right, upon reaching a small section of plain cloth field crossed to its right-hand boundary, there turned back to recross to its left-hand boundary, and turned

TABLE 6
WARP-WEFT TECHNIQUES SUPPLEMENTING THE GAUZE TECHNIQUES

Technique	Collection as a whole	Periods represented		
		Early	Middle	Late
		Number of specimens		
	67	7	21	39
Plain weave				
1 warp, 1 weft.....	48	7	19	22
Basket types				
1 warp, 2 wefts.....	18	..	13	5
2 warps, 2 wefts.....	2	..	..	2
Interlocking warps.....	1	..	..	1
Tapestry.....	12	..	3	9
Pattern weave				
Warp floats.....	2	1	..	1
Weft floats.....	4	..	..	4

again to cross to the right. For each of the turnbacks a new shed (space between warp planes) had to be made and battening done. On the completion of the three crossings the weft had the appearance of a flattened S form. From its position at the right, this weft went on to secure one or more gauze crossings. These completed, the even-numbered weft proceeded across the next section of plain field to the right, turned back to the left, then turned again to the right in readiness to secure the next series of gauze crossings. To carry the even-numbered wefts across, requiring as they did so many changes of the shed, must have taken time, effort, and patience. But the results are apparent: the plain areas, the field for the pattern of open gauze, are compact since there are three wefts in the field for each one in the gauze motive. Thirteen Middle-period weavings are done by this method.

The true basket type, distinguished by two warps crossed by two wefts, three warps crossed by three wefts, etc., occurs in two Late-period cloths very similar in appearance. The Ancon cloth (pl. 20, b) is heavier than the Chancay

²² Mildred Stapley, *Popular Weaving and Embroidery in Spain*, p. 16. fig. 6.

specimen (pl. 16, *a*), and the combinations of gauze types are not the same, but each gauze is crossed by narrow, compact bands of the over-two-under-two basket weave.

A cloth more distinguished by its brocaded crossbands than by its gauze is to be seen in an example of plain weave and a basket-weave variant in the same fabric (pl. 14). All the wefts which secure the gauze crossings are two-ply yarns; fewer than half (13) of the narrow plain-weave bands between the rows of gauze are in two-ply yarns. The greater number (20) are woven of single-ply wefts in pairs. It must have been more convenient to continue weaving with the same yarn that secured the crossings in the gauze rows than to break that off for the twin singles. The heading strip shown in plate 14 is started with pairs. This was probably the heading at the upper bar of the loom, for between it and the remaining two inches of weaving with twin singles is a half-inch section done with two-ply yarns. Contemporary weavers on backstrap looms often have to make adjustments in texture, compactness, or yarns when their work reaches the upper heading strip and the "join" is imminent. At the opposite end of the textile in plate 14 there is no heading, only three loomstrings followed immediately by a patterned crossband.

Twelve of the gauzes have some tapestry weaving either in crossbands bordering the gauze sections (pls. 6, *a*; 17, *b*; 19, *b*) or as decorative edge finishes. Tapestry is woven like any over-one-under-one plain weave, but the wefts are pressed close together, often to the degree of entirely concealing the warps. In the gauzes, one finds pairs of cotton wefts used as one, and in one specimen (pl. 5, *d*) fours of wefts used as one.

Tapestry of the ornamental type occurs in the heading strip on the end of the embroidered gauze headcloth in plate 6, *c*. Forty two-ply red wool yarns are crowded into a half-inch depth.

An Ate shirt has a variety of ornamentation techniques. The ground is brown cotton. From the shoulder fold down, for a distance of more than 20 inches, red tapestry dots alternate with pairs of gauze-woven lines (fig. 11, *e*). The dots begin and end with "streamers," the ends of the weft yarn being held in the same shed with the basic weft. The warps over which the tapestry is woven are three in number, each consisting of five single warps. The pattern-weave border at the bottom of the shirt is flanked by tapestry stripes.

A second Ate shirt, of white cotton, has quarter-inch red tapestry bands flanking the small bird forms (fig. 10, *b*). The larger bird forms in the band above them are in gauze weave, the eyespots in tapestry technique. A Chancay kerchief (MHN 2942) has narrow monochrome tapestry bands flanking the principal pattern bands.

The most ambitious tapestry weaving among our gauze specimens is the border with tabs edging both ends of the fine shawl in plate 9, *a*. The bird motive, of a form familiar in many Late-period textiles, is developed in Kelim or slit-tapestry. The weight of the border is in strong contrast to the sheerness of the gauze mantle.

Pattern weaving of the damask type is found in combination with gauze in three specimens. The most interesting of the three is an Early Nazca fragment

from Majoro (fig. 1) to which a double-face wool border has been sewn. The basic weave of the border is plain, with an overwhelming preponderance of warps: 120 warps by 16 wefts per inch. The center section of warps developing the lozenge and X-form motives is raised and lowered to form floats equally effective on the surface and reverse sides.

In one Chorrillos and two Ate specimens occur pattern weaves of the single-face variety developed by means of weft floats. The border of one Ate cloth (MHN 2440) alternates colored tapestry stripes and a section of pattern weaving. The motives are geometric. The second Ate specimen (fig. 11, *e*) has a border requiring greater effort. The material is for a shirt, and the plain weaving changes near the bottom to tapestry in the form of stripes. To make the change effective, the weaver grouped her yarns in eights crossing the 1, 3, 5, 7 of each unit over the 2, 4, 6, 8. Two things are accomplished: (1) larger warps are provided, the space between them permitting vigorous battening down of the wefts to conceal them, and (2) slippage of the plain weave and tapestry wefts is prevented. Crossing against slip was a device constantly resorted to by weavers who changed over from plain to tapestry technique in the same web. The Chorrillos cloth is distinguished not by its technique but by its three pattern-weave bands (fig. 11, *d*), each with a different motive in weft floats.

Technically, the tabs on the tapestry border mentioned above (pl. 9, *a*) exemplify both warp-float and weft-float pattern weave. This combination results from the method of forming the tabs, a decorative feature of many of the Inca cloths. It appears to have been customary to set up the warps for the border proper in the usual way, but to place at some distance from one edge of it a skeleton warp to be withdrawn upon completion of the weaving. Remnants of skeleton warps are occasionally found. Actual weaving proceeded normally until a tab was to be extended. There the weaver carried her weft beyond the edge to encircle the skeleton warp. She did this on as many picks as the predetermined width of the tab required. In the border of plate 9, *a* the weaver, upon reaching the scroll motives centering the band, changed her technique from tapestry to weft-float pattern weave. The light yarns making the scrolls were also carried out and around the skeleton warp. Subsequently she wove on these extended wefts, which became "warps," and the scrolls on these halves of the tabs are in reality in warp-float pattern weave. A trick like this one, which is not unique in type, reveals how successfully the ancient weaver could free herself from the limitations of a backstrap loom.

Techniques combined with gauze weaves but not dependent upon a warp-and-weft system are few in number. Brief descriptions of these follow.

Plaiting.—Short lengths of three-strand flat braids are applied as surface decoration to an Early Nazca fragment with pattern lines of gauze weaving (fig. 1). Plaits employed in the formation of motives have been found only this once among many hundreds of Peruvian textiles.

Brocading.—This is a method of patterning fabrics through the employment of yarns introduced solely for that purpose; they are independent of the basic warp-and-weft element. Five of the materials composed to some extent of gauze are also brocaded. The Early-period lot from the Paracas Caverns con-

tains two examples. MA 25046 is a white cotton wrapping with one intact end. A border about two inches wide shows by the holes originally outlining the pattern that the fabric was once brocaded in floats of a length to make the motives equally effective on surface and reverse sides. The decorative yarns may have been wools or dyed cottons. Some dark dyes reduced the yarns to powder. The remnants of border on a second specimen (MA 25044) have evidences of brocading similar in style.

No cloths in our Middle-period group are brocaded.

Three of the Late-period cloths have brocaded motives besides gauze-woven decoration. One Ate shirt has bands some fourteen inches up from the bottom, consisting of squares alternately centered by motives in gauze and double-face brocading (fig. 8, *b*). The floats are short, over four or eight warps, and the pattern is effective on the reverse side. Another brocaded specimen from Ate (fig. 9, *b*) has an added interest from the fact that its bird figure and the method of weaving it can be matched by hundreds of examples among present-day Mexican and Guatemalan textiles. For the "streamers" the two ends of the decorative yarn are carried along in the same shed with the regular weft for about an inch. Streamers formed by this procedure are frequently part of the weaver's plan for the design. The main motive is in single-face brocading.

A fairly complicated pattern in double-face brocading is shown in plate 14. The textile is a good piece of weaving on all counts: plain weave, gauze, and brocaded sections.

Needle techniques.—Embroidery is often confused with brocading because of its strong similarity in appearance, and at times the two cannot be distinguished from each other with certainty. The needlework supplemental to the gauze techniques in our collection does not come within this category.

Eight of the specimens have some form of decorative stitchery. The Early-period lot contains none. The two examples in the Middle-period group are alike only in that the particular method of developing pattern required work with the needle. The stitches themselves are not ornamental. The child's shirt, now fragmentary, represents a considerable amount of time and effort (pl. 6, *a* and *b*). The full length of the web is 27 inches (garment length $13\frac{1}{2}$ in.), and every inch of it forms part of the pattern plan. As the plate shows, gauze weaving changes to bands of compact texture, and these to bands of hem-stitched squares. The method of making the squares is in no way unusual although this specimen is unique among Peruvian garments. The puckering of the cloth might easily have been avoided; perhaps the stitches were deliberately pulled tight in order to give contour to the squares. Supertwisted weaving yarns account for the kinks in the weaving elements.

The only other Middle-period embroidery supplemental to gauze is that known as *buratto* (pl. 6, *c*). The method of introducing the colored wools by darning over and under the vertical bars is clear from the reconstruction for an example from the Late period (pl. 7, *a*). The shortest horizontal distance covered by a color includes parts of two gauze units—two bars as shown in the center of each lozenge motive. The needle carried the wool over and under these units as if they were warps in figure-8 technique. If the distance to be covered

is three, four, or more gauze units, the needle treats each of these groups as if they constituted a separate setup of warps. Pressing down the wool wefts to the working edge with firmness results in a texture similar to tapestry in that the wefts conceal the cotton warp elements.

The Late-period specimens include at least six specimens of *buratto*. The gauze fragment from Ancon (pl. 7, *a*) on a foundation material of firm heavy gauze is similar in style and coloring to an Oriental embroidery. Several bands (complete widths, 5 in.) from an unknown site are solidly embroidered in wool. The motives are the typical water birds so frequently occurring in Late-period textiles of all weaves (fig. 8, *a*). A Chancay kerchief has bands of plain gauze (Type I) at each end, within which are embroidered motives combining in one unit birds and fish (?) (fig. 9, *c*).

Although not *buratto* in the usual sense of the term, the Chancay fragment in plate 16, *d* is embroidered gauze. It also represents greater foresight in planning than do the standard *buratto* types, for each area that was to be covered with stitchery was kept free from gauze crossings (pl. 16, *c*). On these very open plain-weave fields the needle carried the thread as in darning: over two warps, under two warps, and so on. Perhaps such work was done as soon as the field for a band or group of motives had been established and while the web was still under loom tension. It seems unlikely that satisfactory results could be achieved unless there was some method of holding the tightly spun yarns out straight.

It is questionable if the child's shirt, of which a border detail is shown in plate 18, *a*, is embroidered. It was simpler for us to make a reconstruction with a needle than with bobbins, but that proves nothing. We have no way of knowing what was easy or difficult for the ancient Peruvians to accomplish. In the openwork border the warps are first divided into groups of fourteen, and then each group of fourteen is redivided into two groups of seven. Ten passages of weft (put in with a needle?) from side to side of these separate groups bring the weaving to a point at which adjoining seven-warp groups are to be united by two passages of the weft all the way across the two groups. The procedure repeats: subgroup woven separately, united, and so on.

The most elementary form of embroidery occurs on a skirt (?) or mantle (?) fragment with tabs (MA 2617). The tab material was woven as a band, which was then slashed from one side edge nearly all the way across to the other. The raw edges resulting from the cutting were finished with the blanket stitch (half hitch).

Where stitchery is needed for seaming together breadths of material or for applying borders and fringed tapes to edges, the whipping stitch has been found unexcelled for many centuries. This elementary technique, frequently called overcasting, makes a flat seam that can be virtually invisible (pl. 18, *b*). Some Middle-period weavers took pains to match their gauze-woven sections in order to maintain the regularity of the patterning. Plates 13, *a* and 18, *d* show successful matching; in plate 13, *b* the weaver exhibited more than mere skill: she drew together the edges by engaging only the weft turns, a device which makes the seam line as open as the gauze weaving itself.

There are very few hemmed side edges or ends among Peruvian textiles. One example in the gauze collection occurs on the cloth shown in plate 7, *a*. It has a turned and stitched hem less than a half inch deep. Even more unusual is the large Chancay mantle (UC 16-1181) of firm, even weave, which is made by seaming together three breadths. The outside edges are rolled and hemmed with fine stitches.

Fringes.—Nine cloths in the gauze collection are fringed pieces, none of which occurs in the Early-period group.

Peruvian fringed cloths are of two general kinds: (1) those edged with short or longer loops resulting from the withdrawal of a loomstring (see section on "Looms") upon completion of the weaving, or of slipping the warp skein over the end bars instead of binding it to them; and (2) cloths finished with separately woven fringed tapes which are sewn on.

Fringes of the first type are visible in plate 18, *a* and *b*, both with warp loops of a length to indicate that the skein was placed over end bars or that the weaving was commenced a short distance from the loomstring. Fringed tapes, the second type, are made on a narrow setup of warps. The weaving proceeds as for ordinary cloth except that each weft extends beyond the edge to pass around a temporary or skeleton weft, withdrawn upon completion of the tape. Usually the loops made by the weft are left as loops, but those in plate 18, *d* appear to have been cut with a poor tool. Among the cloths in this gauze collection, separately woven fringed tapes occur on twice as many cloths as do the warp-loop fringes. Three Ate shirts have sewn-on tape fringes a little more than a half inch wide; the tape plus its weft-loop fringe on one specimen (MA 2617) measures almost two inches.

Rolled tape.—This unique form of edge finish, possibly a strengthening device (pl. 22, *d*), is new to the authors of this study. The material to which the roll is applied is fairly coarse; the texture of the tape is similar. The reconstruction (pl. 22, *c*) was not difficult, nor did it require much time. The edge of the base fabric (also a reconstruction, but not of this particular gauze specimen) was brought up close to the left edge of a narrow setup consisting of nine warp pairs. Each weft for the tape was passed through the shed from left to right as in ordinary weaving, but on the return from the right each weft was carried under the setup and brought up through the edge of the base material. When the weft was pulled tight, the right-hand edge of the tape curled under to form the roll seen in the plate.

End-to-end warp locking.—The reconstruction in plate 22, *a* indicates that warps were set up for two different types of fabric, but the remnant of the plain-woven section is so meager that its type cannot be determined. Changing from plain weave to gauze and back again was standard procedure (pl. 5, *a-c*); there could have been no need of interlocking two warp setups in order to make so simple a change as the fragment evidences.

Applied color.—There are two possible explanations of the method of producing the pattern on the cotton textile in plate 8, *a* and *b*: (1) that the piece was painted, or (2) that it was treated to preserve the light spots from the dark dye into which the whole cloth was dipped. The fragment is composed of

two breadths of material woven alike with alternating plain and gauze-weave crossbands. The side edges of the breadths were seamed together as shown down the center of the plate. Then the entire cloth was given an allover pattern, the motives being carried across the seam line. The ground color visible in the lozenge forms is tan; the boundaries are dark brown.

If the theory of freehand painting is accepted, one should be able to find some brush lines paralleling each other in crossing the fabric. A few of this sort in the upper left corner may have been among the first ones painted. The brush, then, in connecting the longer lines by means of short ones, tended to start and finish with a movement producing rounded corners.

If resist-dyeing seems a plausible interpretation for plate 8, *a*, it can be pointed out that, in applying wax or paste or other forms of resist, a brush-drawn "square" might only rarely have angular corners. With successive repetitions of the same form, there is a tendency to relax effort and to draw cursorily. Plate 8, *b*, an enlargement of a single spot, appears to support the case for resist-dyeing.

Linné²³ states categorically that "the batik method was never employed in ancient America but only introduced by Europeans." In the light of details and features which analysts come upon for the first time even after years of handling Peruvian textiles, the word "never" seems too strong.

²³ S. Linné, *Archaeological Researches at Teotihuacan, Mexico*, Ethnographical Museum of Sweden, n.s., pub. I (Stockholm, 1934), p. 164.

COLOR AND PATTERN

Despite the tendency of the Peruvian weaver to exchange one technique for another within the same web, and to add to an otherwise plain cloth some decorative edge finish, the fabrics of which gauze weaving is a part are notably simple. Three-fourths of the specimens fall into one of three groups: all-white cloths, all-brown cloths, and solid-color cloths.

The solid-color weavings are divided almost equally between the cotton and wool fabrics. In the Early Nazca group there is one very dark blue cotton (CMNH 171141); the Middle-period group has the unusual mauve specimen shown in plate 11, *a*, and the complicated blue gauze in plate 5, *d*, both cottons; the Late-period group includes two blackish blue wools (UC 4-6725, MA number missing).

TABLE 7
COLOR FREQUENCIES

Materials	Total no. in the Collection (67)	Early (7)	Middle (21)	Late (39)
All-white cottons.....	36	3	18	15
All-brown cottons.....	8	..	..	8
Monochrome cottons and wools.....	5	1	2	2

The customary technical methods of introducing color are briefly described in the section on "Supplementary Techniques." Thread holes in two specimens from the Paracas Caverns suggest that the cloths were originally brocaded. This technique usually calls for the use of colored wools, but since a cotton fragment from the Caverns is ornamented with heavy cotton yarns in the same color as those constituting the base material,²⁴ one cannot assume the use of either colors or wools. No gauze sections were brocaded, with the possible exception of those in plate 16, *d*.

A fine example of double-face brocading on plain ground cross-banded with rows of gauze is shown in the kerchief in plate 14. The piece is especially interesting because it contains the largest number of colors occurring in any of the woven patterns. There are five pairs: (1) red and orange, (2) red and white, (3) red and dark green, (4) red and maroon, and (5) orange and golden brown. These occur in the following sequence: 1, 2, 3, 1, 4, 5, 1, 1.

Pattern weaving also introduces color into the web. The most distinctive textiles to which this technique has contributed color in the form of applied tapes are the medium-blue Early Nazca piece in figure 1 and the exceedingly fine brown gauze in plate 9, *a*, a Late-period cloth. The Nazca specimen has a three-color tape in rose, yellow, and green; the Chancay mantle, a five-color tape in rose, pink, yellow, brown, and black.

It is apparent that embroidery was considered more effective than other methods for ornamenting gauze webs. In the embroidery on the Middle-period

²⁴ Textile Periods II, fig. 13.

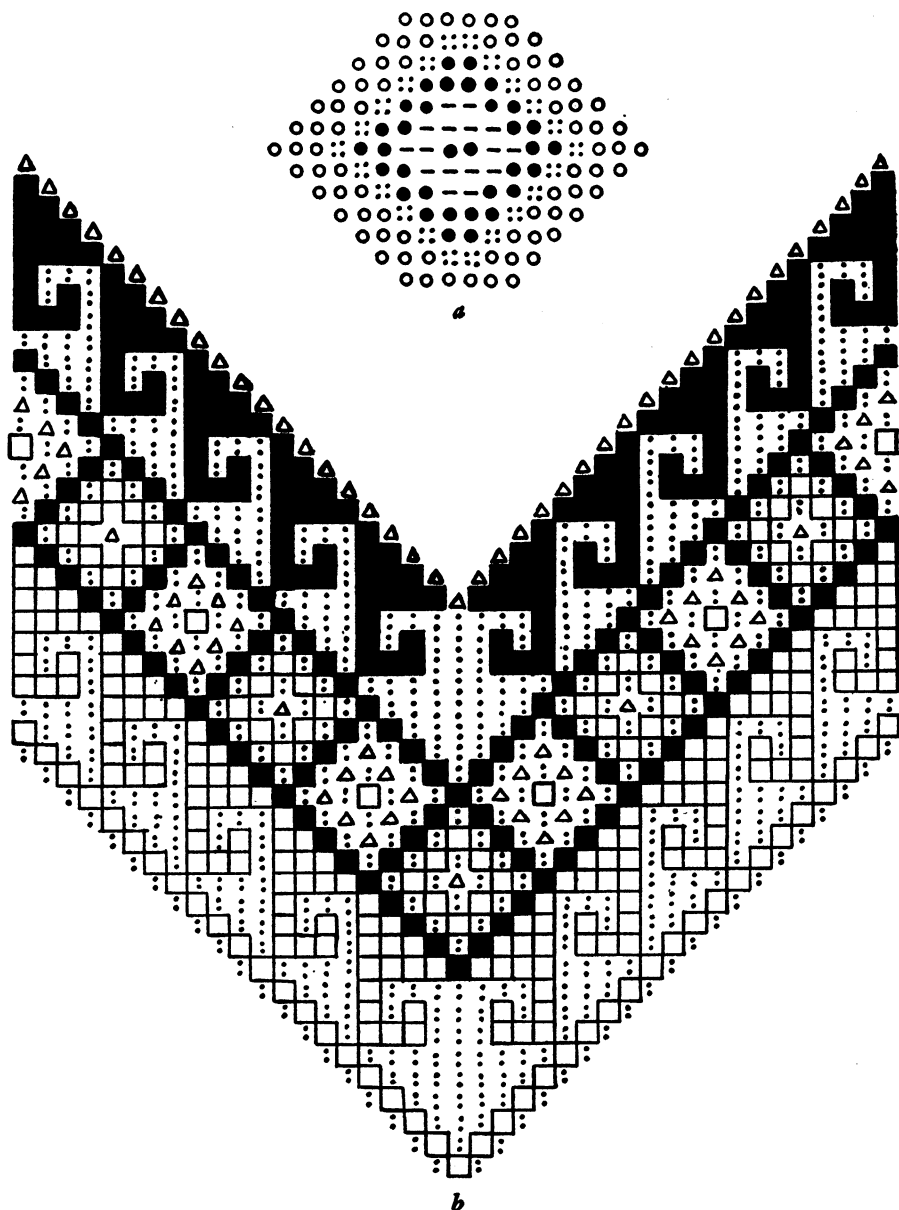


Fig. 4. Supe and Ancon. Gauze-woven pattern on plain-weave ground. *a*, UC 4-7506; lozenge motive $1\frac{1}{2}$ inches wide in three colors embroidered on plain gauze foundation. *b*, UC 16-988; detail of allover embroidery on plain gauze foundation in eight colors. Small squares $\frac{1}{2}$ -inch wide. *a*, Middle period; *b*, Late.

gauze in plate 6, *c* the texture simulates weaving. Plates 7, *a* and 16, *d*, showing Late-period cloths, are similar. The last-named specimen is brown monochrome. Embroidery yarns are generally wools, the numbers used in our gauzes ranging from one through eight. For example, the small motive in figure 9, *c* is embroidered in white cotton on the plain white gauze (Type I) ground, the only

color contrast being the brown wool eyespots. The interlocking bird motives in figure 8, *a* are in rose and two yellows against a brown gauze ground. The detail in figure 4, *a* shows the position of the trio of colors in each lozenge motive in a Middle-period gauze (pl. 6, *c*). Three combinations are used: (1) brown, yellow, red; (2) brown, green, red; and (3) taupe-brown, green-blue, red—a total of six colors. The arrangement gives the impression of a maintained sequence, with the emphasis on diagonal lines.

The most elaborate of the pieces, so far as color is concerned, is the Ancon gauze in plate 7, *a*. The pattern is geometric, basically a zigzag with elements of the step-fret motive and latchhooks (fig. 4, *b*). There are eight colored wools in the small fragment: rose and orange-red, light blue, light and dark yellow, tan, brown, and black.

The colors of the gauze webs and of the yarns added for decoration provide only one surprise: the mauve in the specimen from Tunga (pl. 11, *a*), one of the relatively rare occurrences of purple as a base color. It approximates Maerz and Paul's color sample 47E5. The senior author has examined one other purple piece comparable to this in size, an Early-period fragment of cotton veiling (CNHM 170476a) from Majoro, also in the Nazca Valley. The 43-inch length is incomplete; the 16-inch breadth, complete. The Tunga gauze measures 32 inches (incomplete) by 13 inches (complete). An analysis of the dyed yarns in Early Nazca weavings²⁵ brought out the fact that some colors were available or were in favor in their light, medium, and dark hues, but that the dark hues of others often appear to the virtual exclusion of those in the other two classes. The red-purples and blue-purples are in the latter group.

The frequencies of the colors represented in the gauze collection are what one would expect to find. First in order are the red-to-orange hues (pink, rose, red, maroon, orange-red, orange) and the yellows (green-yellow, orange-yellow, cream), followed by the blues (green-blue, light and dark blues), and the browns (golden, tan). Green usually appears modified, and blacks are bluish or brownish.

Brown was a favorite color with the Peruvians, if one may judge by the extensive use of the natural brown cotton and the various shades which must have been produced with dyes. The Early-period weavers combined it with white and gray in striped materials.²⁶ The gauze collection includes three Late-period cloths which give additional evidence of a continued predilection for browns.

Shirt material (MA 2586) is crossed by quarter-inch bands of gauze weaving set about that same distance from each other. All the warps, and those wefts which form the plain-weave bands, are white; the warps securing the crosses in the gauze bands are natural brown cotton; specimen MHN 6225a is a fragment of white cotton with crossbands of gauze from one to three inches wide. The wefts within these are dark brown cotton.

Plate 15, *b* cannot do justice to the subtle color harmony in a Late Ica gingham. The warp setup consists of a series of repeated units, their yarns also

²⁵ L. M. O'Neale, *Textiles of the Early Nazca Period*, FMNH-M 2 (1937): 136-152.

²⁶ O'Neale, as cited, pp. 160-161.

in a sequence consistently repeated: natural white (actually deep cream), gray, white, dark brown, natural brown, dark brown. Wefts in the plain-weave crossbands are natural brown; those in the gauze bands, dark brown.

The patterning of the few available gauze fabrics from Early-period cultures has been commented upon in other connections in this study. The design motives are merely suggested by the fragments shown in figure 1 and plate 12. Plate 12, *a* shows one of two Cahuachi specimens with the same motives, the larger of which is illustrated. It is a white cotton strip 32 inches long with carefully executed stepped frets 5 inches by 3 inches in a gauze type (Type IV) characteristic of all the known periods on the coast. The allover pattern is formed of vertical stripes in which the long axis of the frets extends warpwise. Those in each successive stripe drop down almost half the length of the motive. The arrangement just misses being the familiar half-drop repeat. A smaller Cahuachi fragment, not shown, is of blackish blue cotton with a similar allover pattern of frets.

There are interesting similarities between these fragments, in which the pattern is executed in gauze technique to contrast with a plain-weave ground, and a "large veil for the head" illustrated by Doering.²⁷ In this piece, the gauze forms the ground and the motives (fish) are in plain cloth weave. Doering's specimen, also from Cahuachi, was found draped like a turban on the head of the mummy.

From the Paracas Caverns come gauzes exhibiting much more ambitious patternings.²⁸ The gauze sections of the several specimens examined in Lima were alike in being crowded with faces, heads, and forms, a few so highly stylized as to defy identification. Large heads which bore resemblances to human, fish, or cat heads measure 8 or 9 inches in length by 4 or 5 in width. A method favored by Peruvian weavers of all periods is revealed in full development in these Early-period gauzes. The principle of inversion, both horizontally and vertically, lent variety to a composition involving a single motive. One of the best exemplifications is found in the fragments of a gauze mantle from the Caverns.²⁹ Fortunately the pieces are of a size to permit reconstruction of the whole. The Peruvians' rigid adherence to repetition helps to establish dimensions and the entire plan. An excellent analysis of the composition and details of this weaving has been published by Professor Muelle.³⁰

Middle-period gauze patterns in cloths in our group are of two types: (1) crossbands of openwork which alternate with plain-weave bands, some very narrow, others wider, but none exceeding two inches; and (2) patterns in which the motives are identifiable as fish and birds. The crossbands need no explanation; but it should be pointed out that they are basic to the formation of all patterns in gauze technique. The most complicated motives are formed of shorter or longer horizontal rows of gauze crossings, which the weaver can begin or end at any desired point in the web.

²⁷ H. U. Doering, *Old Peruvian Art* (London, 1936), p. 16, pl. 54.

²⁸ *Textile Periods II*, pl. 1.

²⁹ *Textile Periods II*, fig. 6.

³⁰ J. C. Muelle, *Estile de Cerro Colorado*, RMN, No. 2 (1932), pp. 81-89.

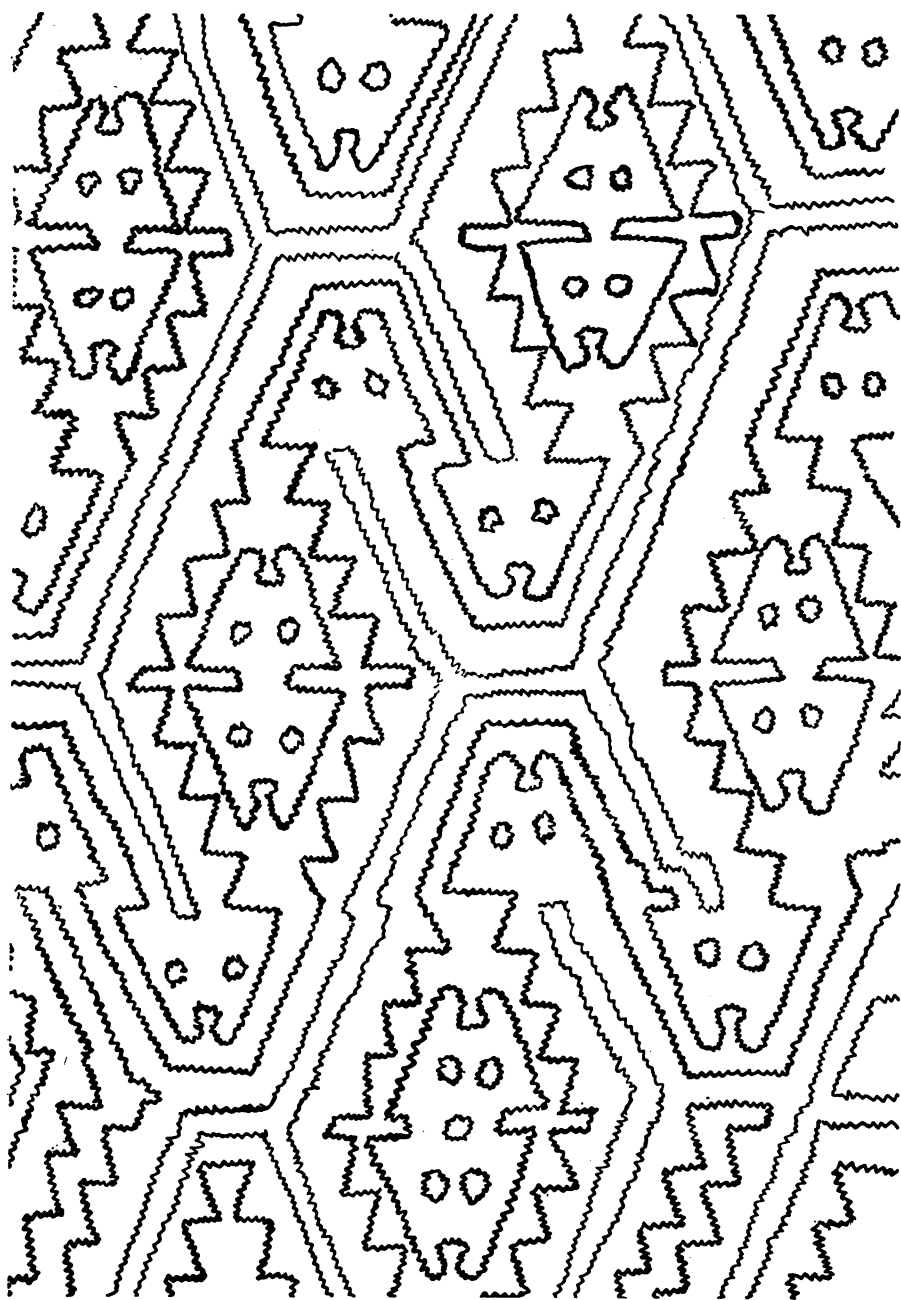


Fig. 5. Supe. UC 4-7481c. Section of Middle-period pattern in Type IV gauze weave on plain-weave ground. Unit of repeat approximately 7 inches long.

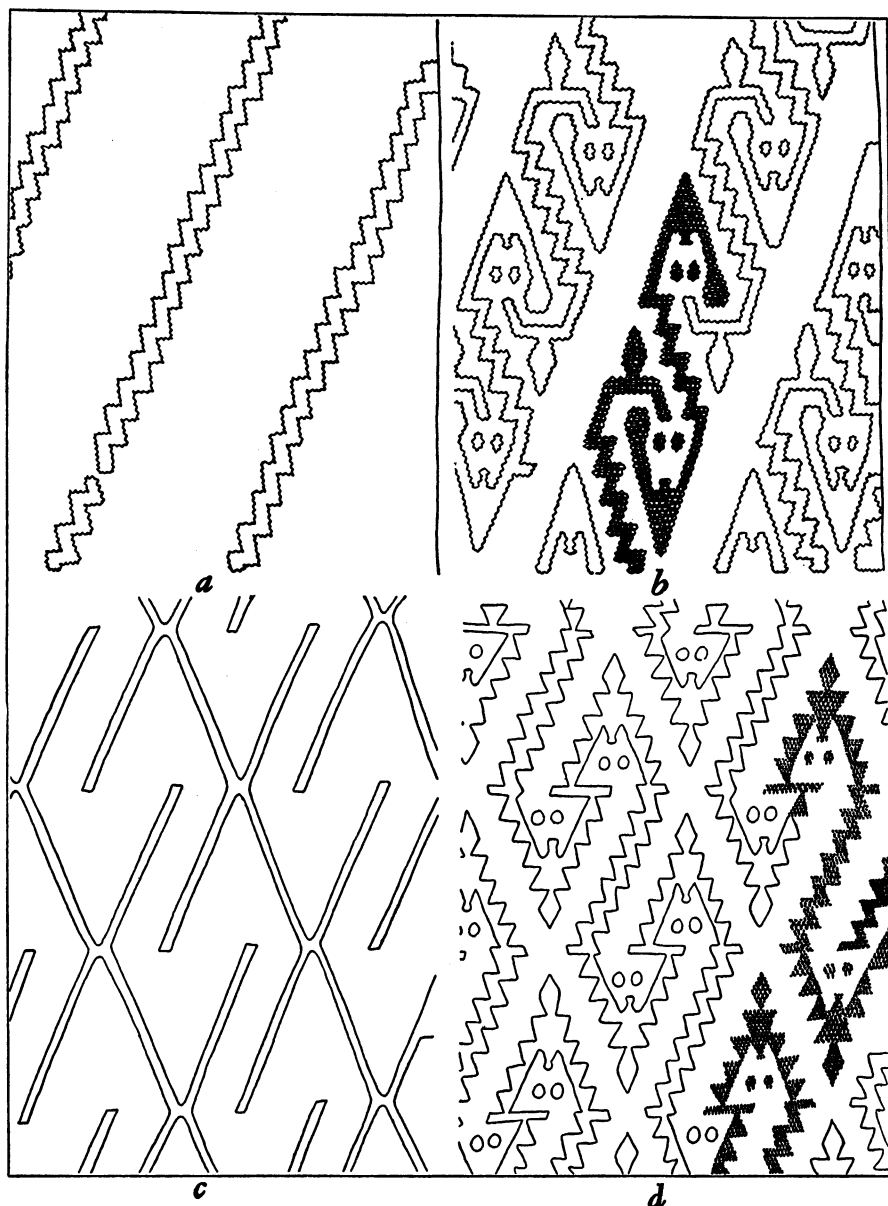


Fig. 6. Supe. Elements of Middle-period pattern in Type IV gauze weave on plain-weave ground. *a, b*, UC 4-7481g. *c, d*, UC 4-7481j. Lengths of principal motives 8 and 9 inches respectively.

Allover patterns in the gauze technique (fig. 5) held great interest for Middle-period weavers at Supe. The cotton cloths in plate 13, *a-c* represent finds from one burial which contained eleven weavings of marked similarity. The pattern style in these is characterized by two elements. The first is a series of diagonals formed of repeated units of the principal motive which zigzag upward to the right or to the left. There is no difference in the appearance of the

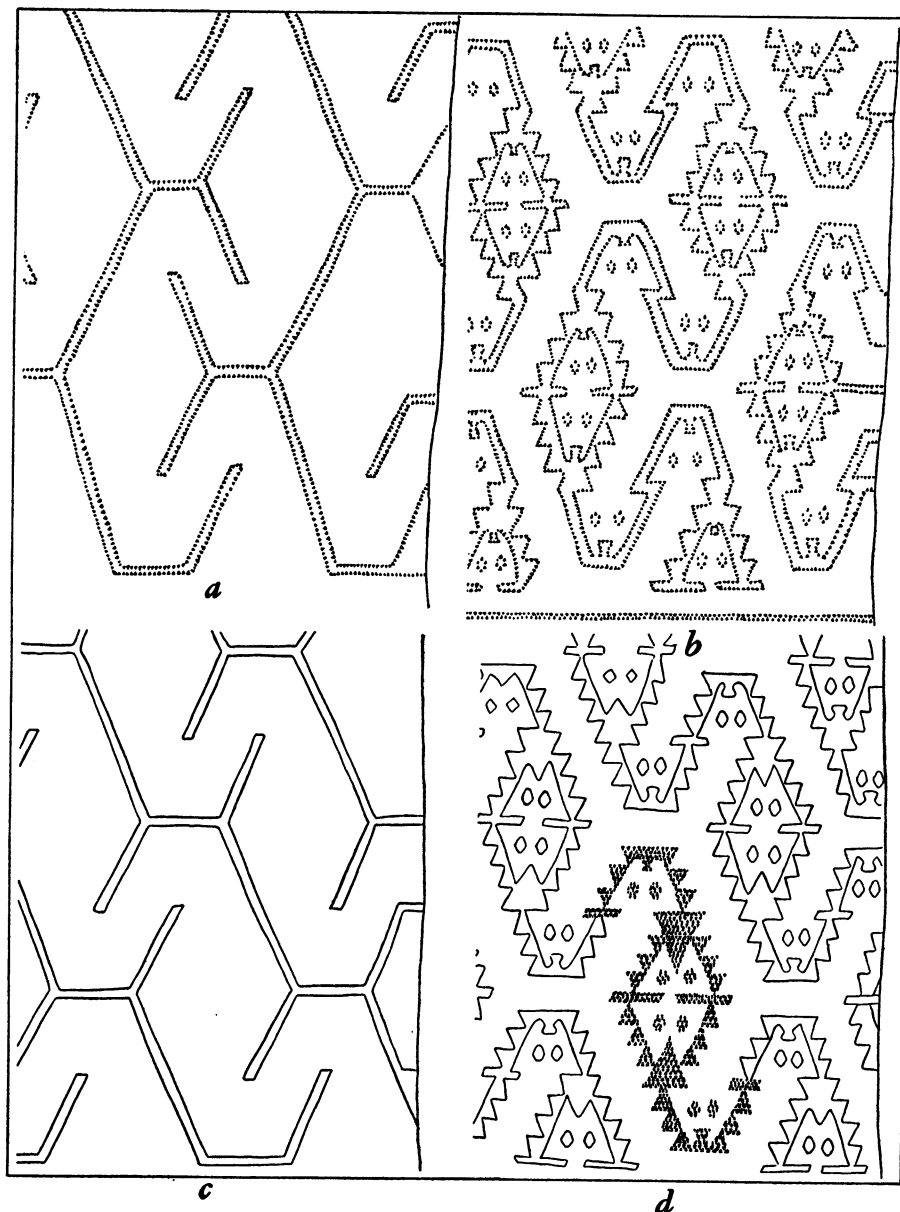


Fig. 7. Supe. Elements of Middle-period pattern in Type IV gauze weave on plain-weave ground. *a, b*, UC 4-7481b. *c, d*, UC 4-7481k. Lengths of principal motives 7 and 6 inches respectively.

surface and the reverse sides of a gauze-woven fabric, nor is there any means of knowing which direction the Peruvians thought "correct." Modern twills are standard when the wale extends upward to the right, but in a four-breadth Supe mantle (UC 4-7481c) the movement is upward to the left in two breadths, upward to the right in the adjacent pair. The angular secondary element does not touch the principal motive at any point, but serves as space filler. That

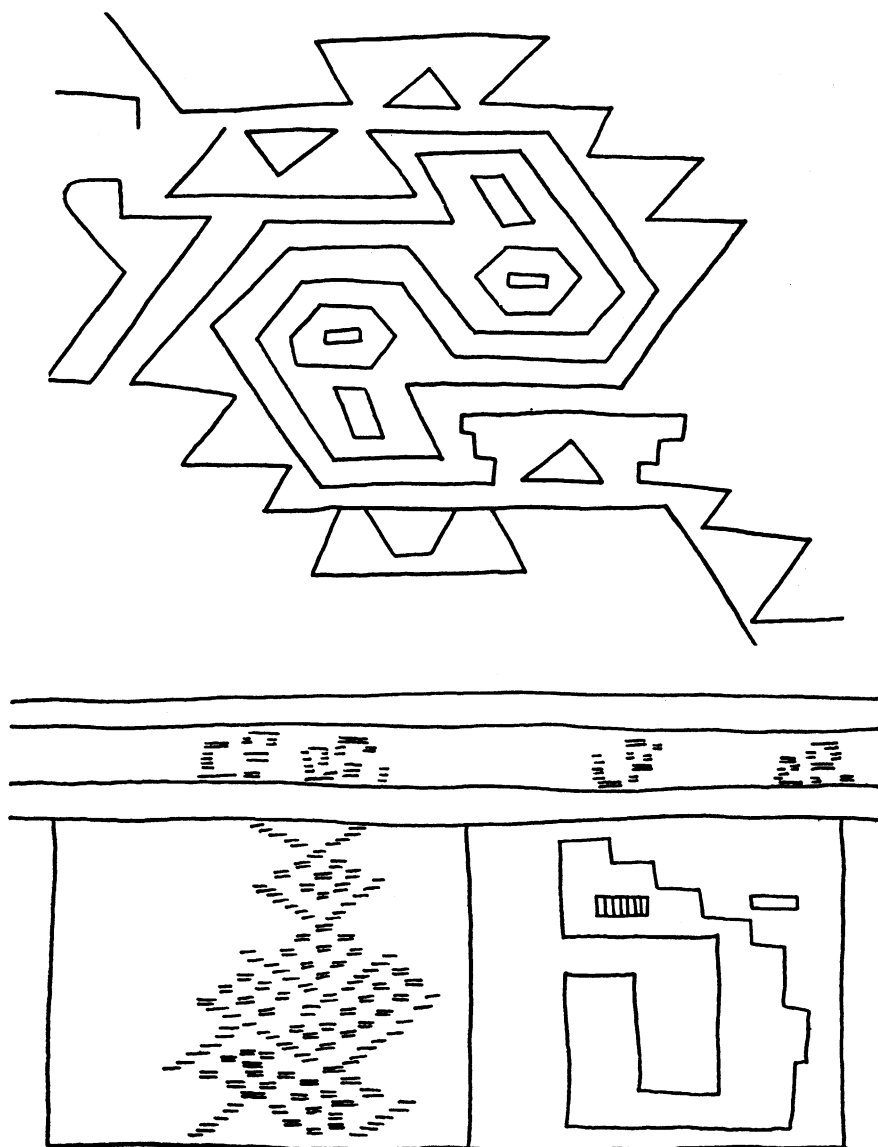


Fig. 8. Site unknown and Ate. Motives from Late-period gauzes. *a*, MA 3141; typical Late-period interlocking bird motive in embroidery on gauze ground; length $3\frac{1}{2}$ inches. *b*, Ate. MHN 2439; trimming band at bottom of Late-period cotton shirt; alternate squares in brocade and gauze weave; bird motive in gauze approximately $1\frac{1}{2}$ inches long.

the motive-filler combination was conventional may be appreciated by comparing the two gauzes in figures 7 and 8, in which the two elements are separately drawn.

The principal motives are of the interlocking fish or serpent varieties. They are double-headed with dentate bodies. Some extend from edge to edge in an unbroken diagonal (fig. 6, *c*, *d*); one forms an apparently unbroken diagonal by alternating angular S motives of two types (fig. 6, *a* and *b*). Figure 7, *a* and

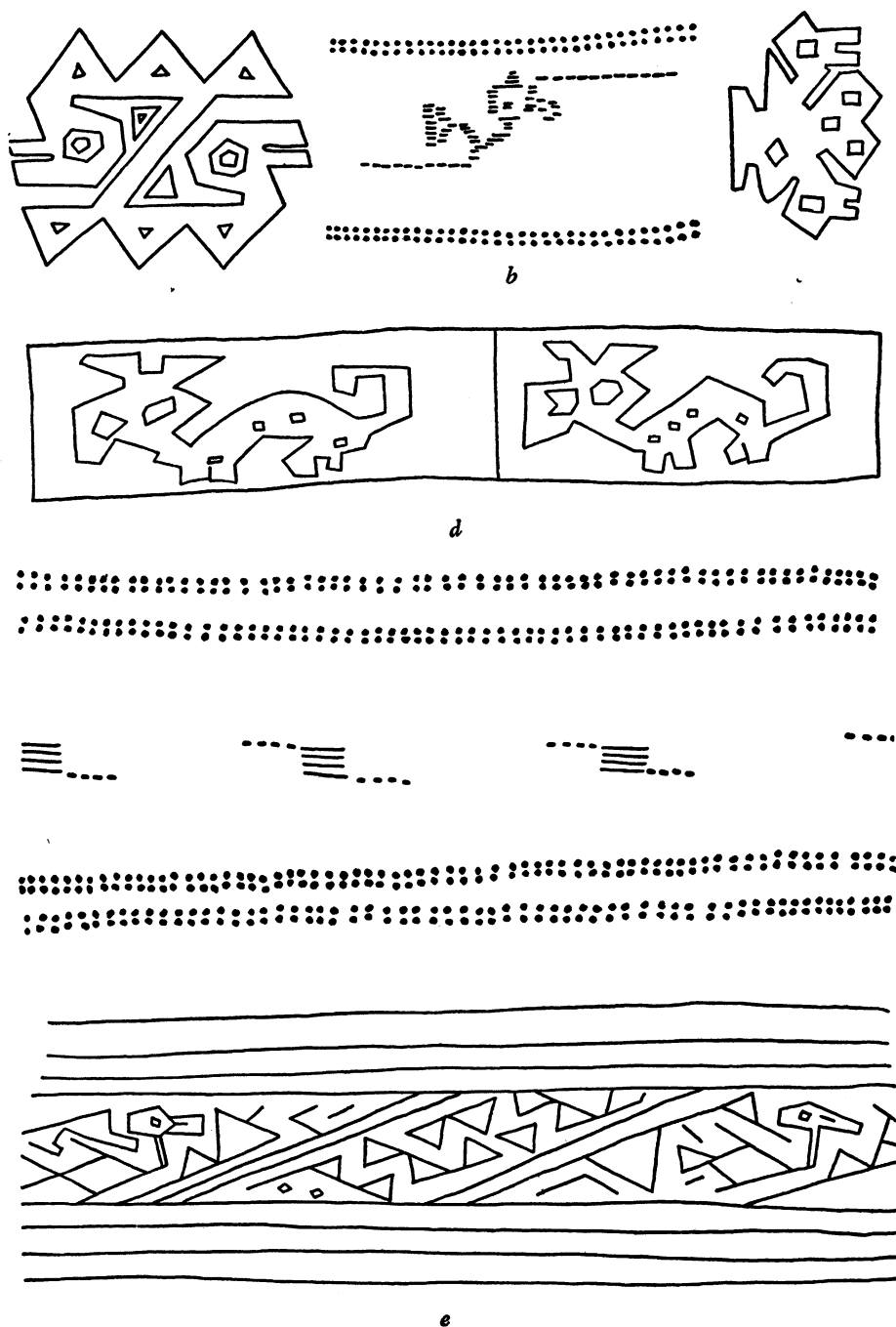


Fig. 9. Chorrillos, Ate, Chancay. Motives from Late-period gauzes. *a, d*, Chorrillos. MHN 1349; motives supplementing gauze; width of band, 1 inch. *b*, Ate. MHN 2440; brocaded bird motive between lines of gauze weave; length of motive, 3/4 inch. *c*, Chancay. MHN 2942; bird-and-cat motive embroidered on gauze ground; width of motive, 1 1/4 inches. *e*, Ate. MHN 2445; lines of gauze forming crossbands to border pattern motives in other techniques decorating a brown cotton shirt. Band at lower edge more than 1 1/2 inches wide. *a-e*, Late period.

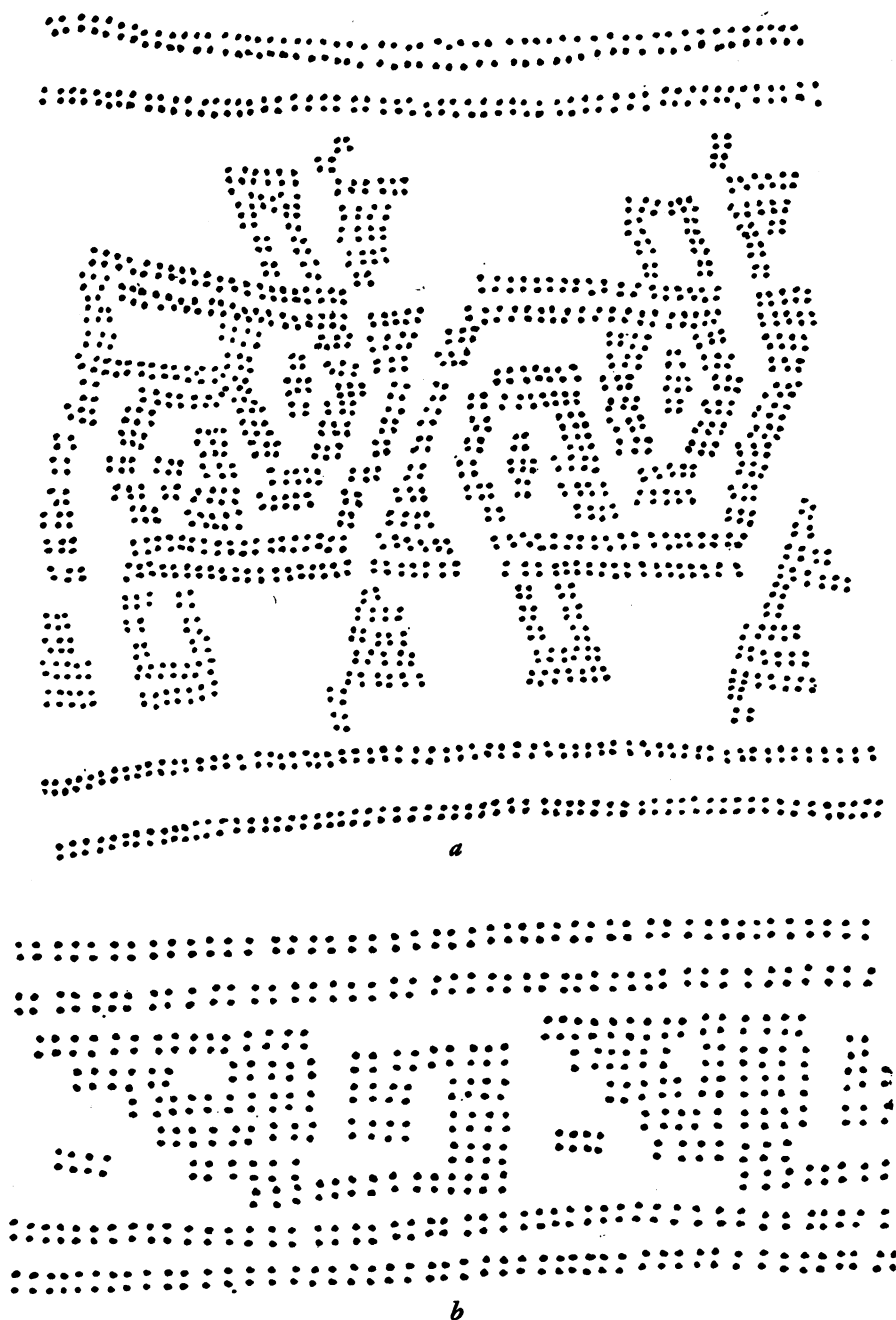


Fig. 10. Supe and Ate. Bird motives in gauze weave on plain ground. *a*, Supe. UC 4-7550; bird forms in gauze technique from sleeve of Middle-period shirt; width of band, approximately 5 inches. *b*, Ate. MHN 2429; section of one of several bands trimming bottom of Late-period shirt; bird motive, approximately 1 inch high.

b gives the impression of being like the others, whereas in reality its upward zigzags make vertical, not diagonal, stripes.

The gauze cloths in this allover style are by no means lacking in individual differences. Several of the specimens are like figure 5 in all but the proportions of the lozenges forming the fish heads. Lengths of motives are within a fairly narrow range: the distance from the top to the bottom of a single unit of the zigzag in figure 7, *b*, *d* is approximately $6\frac{1}{2}$ inches; of a single unit in figure 6, *b*, *d*, approximately $8\frac{1}{2}$ inches. The angle taken by the diagonals also varies from 45 degrees (pl. 13, *c*) to 70 degrees (figs. 6, *b*, *d*; 7, *d*) to 90 degrees (fig. 7, *b*).

The pattern resemblances between these Middle-period Supe gauzes and those from Paracas Caverns are strong. The textures are appreciably different, as comparison of plates 12 and 13 reveals.

In the Late periods, gauze weaving finds its most distinctive expression in the allover patterns. These are of the greatest importance to an understanding of the technique since they prove a confident use of the principle of warp crossing and permitted a wide range of effects. Courses of horizontal zigzags (pls. 9, *b*; 10, *a* and *b*) constituted a favorite allover; another favorite consisted of rectangles alternating with oval openings, to judge by three specimens, one of which is shown in plate 15, *a*. Still a third type of crossband allover, in which one gauze type is exchanged for another, is exemplified in plates 16, *a* and 20, *b*.

A second group of Late-period cloths have the gauze weave forming pattern motives against a plain-weave ground. Gauze-woven man motives in plate 17, *b* and frets (?) or bird forms (?) in figures 8, *b* and 10, *b* fall in this category. Least impressive of all the uses of gauze weaving is that which shows crossbands of openwork breaking the compact texture of a plain-weave fabric, as in plate 15, *b*, or contrasting with heavy brocaded pattern bands, as in plate 14. At this stage, gauze must be regarded as merely incidental to the pattern as a whole. It is quite obvious, however, that the Peruvians considered it a useful technique to be adapted to a number of effective uses.

In the Late period the design motives, whether gauze-woven or developed in other techniques to supplement the gauze weave, are the familiar ones, including interlocked birds, two-headed birds, cats, men, frets, latchhooks, and geometric forms.

CONCLUSIONS

Some textiles woven in gauze techniques are similar in appearance to laces; more of them have openwork patterns on plain-weave grounds or simple cross-lines of gauze weave. Almost all the cloths in the collection are woven in accordance with the requirements of one or more of the basic units in figure 2. The Peruvians' adaptations of these for use in cloths which resemble laces were highly successful. The Peruvians also embroidered patterns on netted ground materials, a combination as aesthetically effective, perhaps, as the gauzes, but less of a technical achievement.

Analyses followed up by reconstructions in string of the several gauze patterns led to the discovery that it would have been practical to weave the most intricate fabrics in the collection (pls. 9, *b*; 10, *a* and *b*) on the backstrap loom; and furthermore, that no other than the standard shed roll and heddle stick with string loops were required for warp controls. For all but two gauze types (Type IV, aberrant, and Type V) one or the other of these fundamental loom devices made the necessary crossings prior to the passage of half of the lines of weft. Alternating with these were crossings which had to be made with the fingers. The complexity of the patterns, then, was less a matter of warp manipulation than of imaginative planning and permutation of the basic possibilities.

As is true of other aspects of ancient Peruvian textiles thus far investigated, we find the gauze technique fully developed in the Early period. The Cahuachi, Nazca, and Paracas Caverns specimens (pl. 12, *a-c*) are Type IV gauzes. These require a series of our warp crossings to form a single repeat; the fifth crossing begins the new unit. Since most of the other gauze types found among our cloths require only two crossings for a repeat, there appears no reason for considering Type IV the initial gauze attempted. Frequencies prove that it was highest in favor among weavers of all periods (table 4).

One other point is brought out by the study: the principle of warp crossing was successfully adapted to the decoration of cotton and wool materials of different textures and qualities from a commonplace brown-and-white striped gingham (UC 4-5473g) to the filmy mantle in plate 9, *a*.

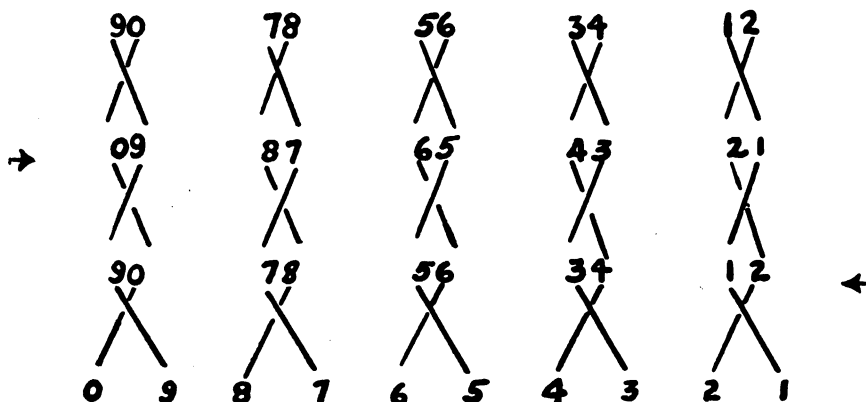
APPENDIX

The warp-grouping diagrams correspond to certain of the reconstructions among the plates. We cannot know the methods by which the gauze weavers accomplished their results, but we offer possible procedures based upon those by which we duplicated the effects. Each reconstruction was made according to the steps outlined to explain its warp-grouping diagram. The digits 1 to 10 (represented by 0) and the letters *a* to *h* represent individual warps, and the order in which they appear shows the exact position of each warp prior to the passage of a line of weft to secure the crossings.

The apparent intricacy of the diagrams diminishes as one sees that, with the exception of Type IV, aberrant, and Type V (diagrams J, K), every other line of weft secures the crossings of the same warps: 1 and 2, 3 and 4, 5 and 6, etc. According to our methods of working, the first crossings—those of primary importance to the pattern—are effected prior to the bobbin's traveling from the right selvage across to the left. The second crossings—those which are the same in all but two of the gauzes—are made prior to the return of the weft from left side to right. These second crossings involve single yarns on their return from the positions to which they were carried in the first crossings. In consequence, regardless of type, the even-numbered lines of weft look alike.

Diagrams read from right to left because in duplicating the interlacings we found it "natural" for right-handed persons to manipulate the warps with the left hand and to insert a slender tool as warp-lifter with the right. The ancient Peruvians, judging by the methods of contemporary gauze weavers in highland Guatemala, very probably followed the same course.

We classify as "active" warps those which make the crossings and are under the line of weft; as "inactive" or "passive" warps, those which do not move from their parallel positions and are on top of the line of weft.



A

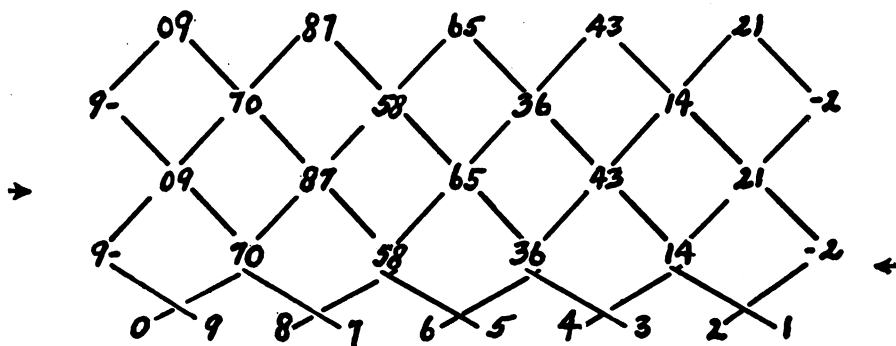
TYPE I

(Diagram A; pls. 3, a; 6, a, etc.)

Two steps complete the pattern unit:

1. Bring forward shed roll and insert sword in front of heddle to keep odd-numbered warps on upper plane. With left forefinger draw to left warp 1 passing over the sword; pick up warp 2 on right side of warp 1 by any warp-lifting device; draw warp 3 to left; pick up warp 4, and so on across web. Put through first weft of unit to maintain line of crossings.

2. Raise heddle. All even-numbered warps return to original positions; in so doing, warp 1 crosses 2, warp 3 crosses 4, etc. Put through final weft of unit.



B

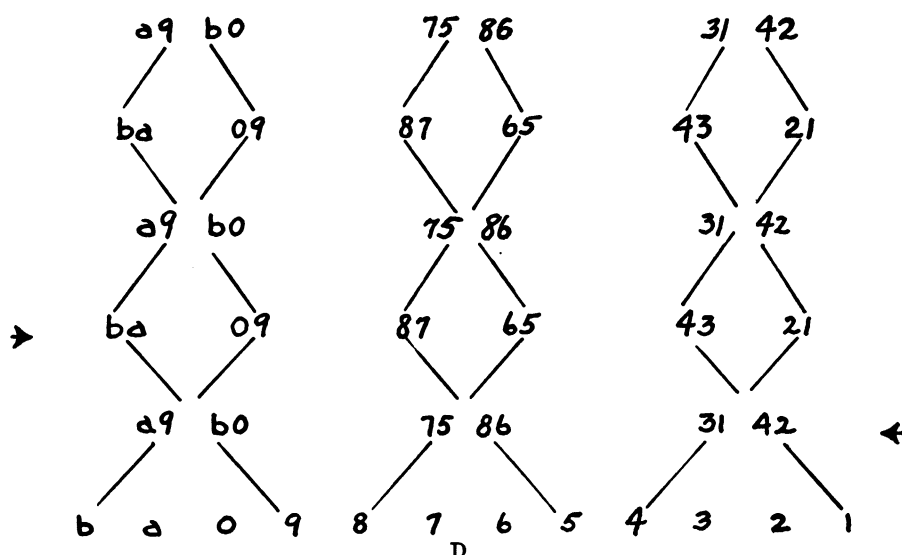
TYPE II

(Diagram B; pls. 3, b; 9, a)

Two steps complete the pattern unit:

1. Bring forward shed roll and insert sword in front of heddle to keep odd-numbered warps on upper plane. With left forefinger draw to left warps 1 and 3 passing over sword; pick up warp 4 on right side of warp 1 by any warp-lifting device; draw warps 3 and 5 to left; pick up warp 6, and so on across web. Put through first weft of unit to maintain line of crossings.

2. Raise heddle. All even-numbered warps return to original positions; in so doing, warp 1 crosses 2, warp 3 crosses 4, etc. Put through final weft of unit.



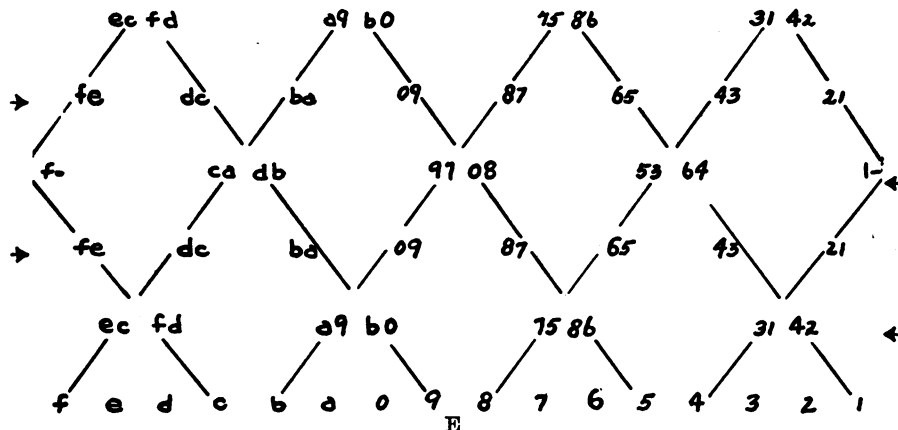
TYPE III

(Diagram D, pls. 4, a; 11, b)

Two steps complete the pattern unit:

1. Bring forward shed roll and insert sword in front of heddle to keep odd-numbered warps on upper plane. With left forefinger draw to left warps 1 and 3 passing over sword; pick up warps 2 and 4 on right side of warps 1 and 3 by any warp-lifting device; draw warps 5 and 7 to left; pick up warps 6 and 8, and so on across web. Put through first weft of unit to maintain line of crossings.

2. Raise heddle. All even-numbered warps return to original positions; in so doing, warp 1 crosses 2, warp 3 crosses 4, etc. Put through final weft of unit.



TYPE IV

(Diagram E, pls. 3, b; 13, a-c)

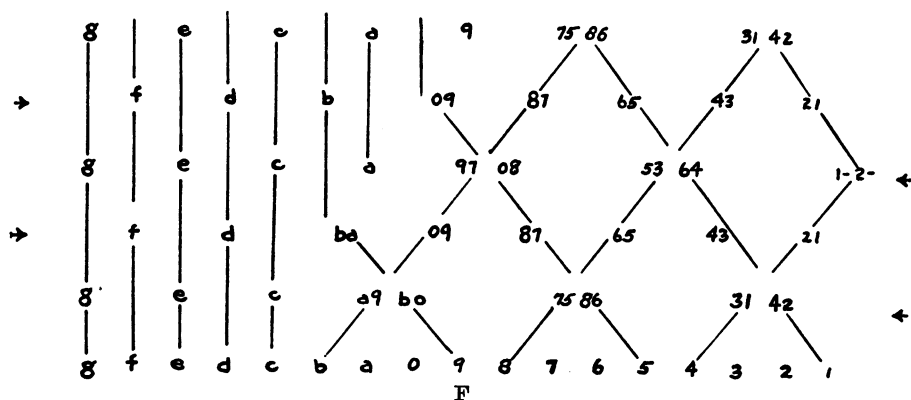
Four steps complete the pattern unit:

1. Bring forward shed roll and insert sword in front of heddle to keep odd-numbered warps on upper plane. With left forefinger draw to left warps 1 and 3 passing over the sword; pick up warps 2 and 4 on right side of warps 1 and 3 by any warp-lifting device; draw warps 5 and 7 to left; pick up warps 6 and 8, and so on across web. Put through first weft of unit to maintain line of crossings.

2. Raise heddle. All even-numbered warps return to original positions; in so doing, warp 1 crosses 2, warp 3 crosses 4, etc. Put through second weft of unit.

3. Bring forward shed roll a second time and insert sword in front of heddle. Draw warps 3 and 5 to left; pick up warps 4 and 6; draw warps 7 and 9 to left; pick up warps 8 and 10, and so on across web. Put through third weft of unit.

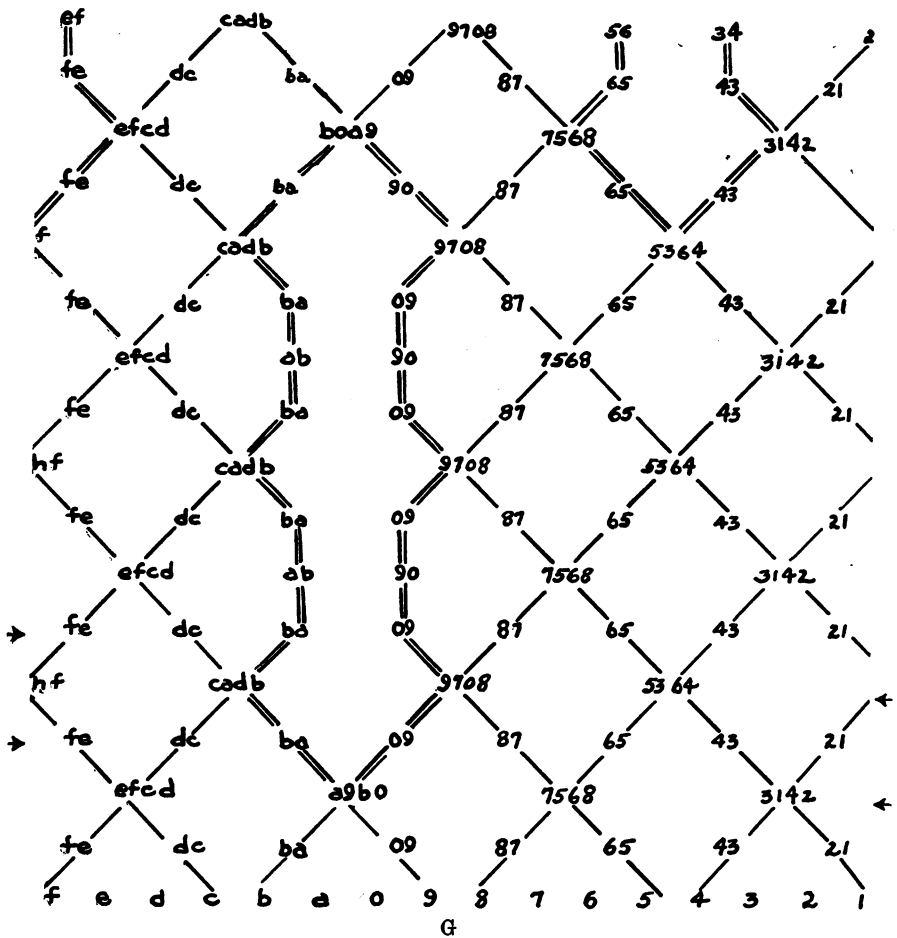
4. Raise heddle. All even-numbered warps return to original positions as in step 2. Put through final weft of unit.



TYPE IV

(Diagram F, pls. 17, a; 20, a)

Four steps complete the pattern unit. These are the same as those outlined for diagram E, except that the weaver discontinues the crossings at certain points in order to form the plain-weave ground.

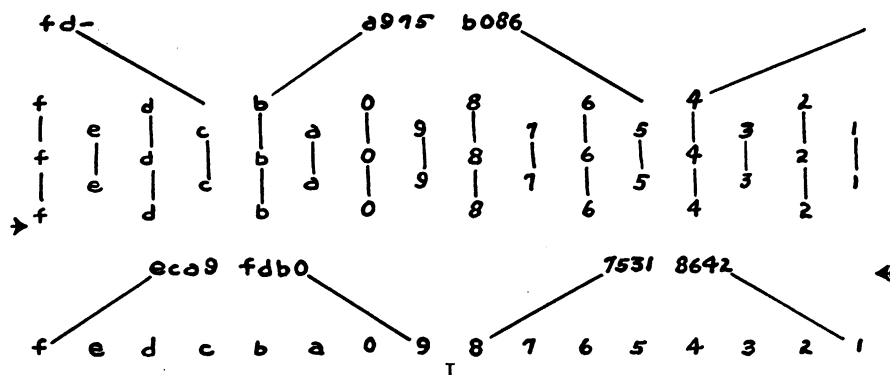
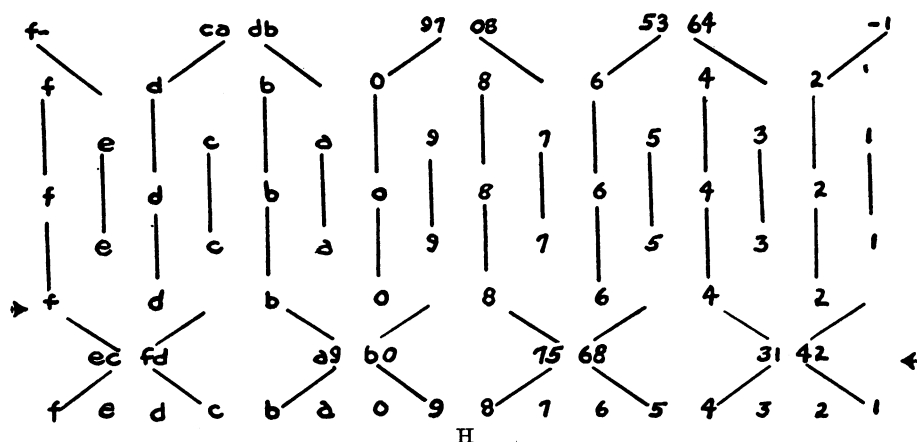


TYPE IV, VARIANT A
(Diagram G, pl. 15, a)

The pattern unit in the Chaney gauze (pl. 15, a) from which the reconstruction was made extends through thirteen lines of weft. Steps 1, 2, 3, and 4 are the same as those of Type IV; but instead of closing the opening by beginning a new unit, step 5 elongates the opening.

5. Bring forward shed roll a third time and insert sword in front of heddle. Draw warps 1 and 3 to left; pick up warps 2 and 4; draw warps 5 and 7 to left; pick up warps 6 and 8; draw to left single warp 9; pick up warp 10 on right side; draw to left single warp a; pick up warp b on right side. Until the edge of the next opening is reached, the active warps are drawn to the left in pairs as in step 1. Put through fifth weft of unit.

6. Repeat step 2.
7. Repeat step 3.
8. Repeat step 2.
9. Repeat step 5.
10. Repeat step 2.
11. Repeat step 3.
12. Repeat step 2, the final step in the gauze unit.



TYPE IV, VARIANT B

(Diagrams H, I, pls. 17, a-b; 18, a-d)

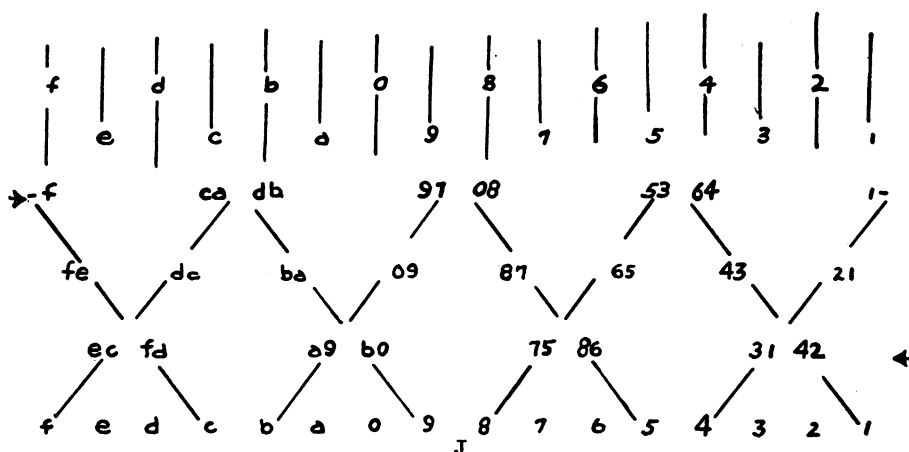
As exemplified by the reconstructions, the pattern unit in diagram H extends through seven lines of weft:

Steps 1 and 2 are the same as steps 1 and 2 of Type IV.

Steps 3 to 6 continue the simple over-one-under-one plain weave.

Step 7 is the same as step 3 of Type IV.

Technically, diagram I differs from diagram G only in the number of active and passive warps in the gauze crossings: four odd cross four even warps.



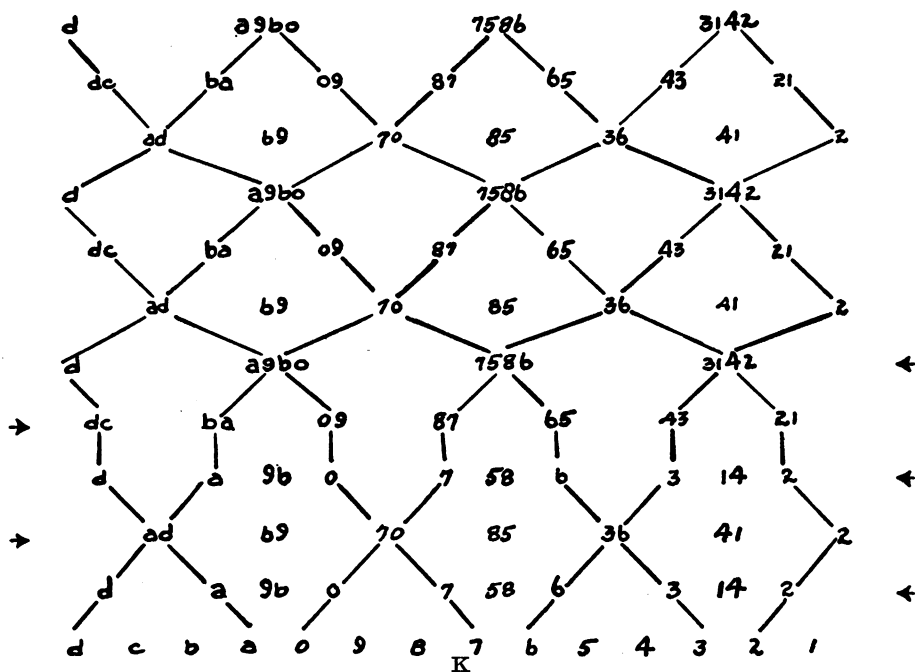
TYPE IV, ABERRANT (?)
(Diagram J, pl. 20, a)

Three steps complete pattern unit:

1. Bring forward shed roll and insert sword in front of heddle to keep odd-numbered warps on upper plane. With left forefinger draw to left warps 1 and 3 passing over the sword; pick up warps 2 and 4 on right side of warps 1 and 3 by any warp-lifting device; draw warps 5 and 7 to left; pick up warps 6 and 8, and so on across web. Put through first weft of unit to maintain line of crossings.

2. Raise heddle and insert sword in shed to keep even-numbered warps on upper plane. With right forefinger draw to right warps *d* and *b* passing over the sword; pick up warps *c* and *a* on left side; draw to right warps 10 and 8; pick up warps 9 and 7, and so on across web. Put through second weft of unit.

3. Bring forward shed roll to return all warps to original positions. Put across the final weft of unit. Our gauze piece has plain over-one-under-one weaving following this narrow gauze crossband.



TYPE V

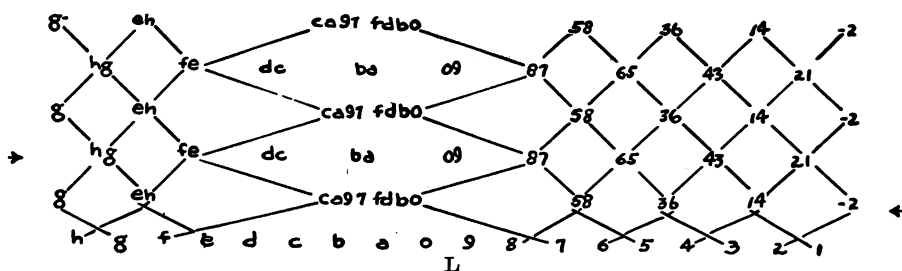
(Diagram K, pl. 5, *d* and *e*)

Three steps complete the pattern unit, although the beginning (or ending?) of the section shows an order of steps 1, 2, 1, 3, as given below. Thereafter, the order is consistently 1, 2, 3, as follows:

1. Bring forward shed roll and insert sword in front of heddle to keep odd-numbered warps on upper plane. With left forefinger draw to left warps 1 and 3 passing over sword; pick up warps 2 and 4 on right side of warps 1 and 3 by any warp-lifting device; draw warps 3 and 5 to left; pick up warps 6 and 8, and so on across web. Put through first weft of unit to maintain line of crossings.

2. Bring forward shed roll a second time and insert sword in front of heddle. Draw warps 3 and 5 to left; pick up warps 4 and 6; draw warps 7 and 9 to left; pick up warps 8 and 10, and so on across web. Put through second weft of unit.

3. Raise heddle. All warps return to original positions. Put through final weft of unit.



COMBINATION OF TYPES II AND III

(Diagram L, pl. 19, *a* and *b*)

Two steps complete the pattern unit:

1. Bring forward shed roll and insert sword in front of heddle to keep odd-numbered warps on upper plane. With left forefinger draw to left warps 1 and 3 passing over sword; pick up warp 4 on right side of warp 1 by any warp-lifting device; draw warps 3 and 5 to left; pick up warp 6; draw single warp 5 to left; pick up warp 8. Then draw warps 7, 9, *a*, and *c* to left and pick up warps 9, *b*, *d*, and *f*. From then on across the web draw odd-numbered pairs to the left and pick up single even-numbered warps as at the beginning of the row. Put through first weft of unit to maintain line of crossings.

2. Raise heddle. All even-numbered warps return to original positions; in so doing, warp 1 crosses 2, warp 3 crosses 4, etc. Put through final weft of unit.

PLATES

Numbers with the prefix 4- designate specimens in the University of California Museum of Anthropology for which the precise provenience is known; the prefix 16- designates specimens for which the precise provenience is unknown, or those which are surface finds.

Arrows by the letters on plates denote the direction of the warp.

Plate 3. Reconstructions of gauze types. *a*, Type I. *b*, Type II. *c*, Type II, A.

Plate 4. Reconstructions of gauze types. *a*, Type III. *b*, Type IV. *c*, Type IV with plain-weave section. *d*, Type IV, aberrant. *e*, Type IV, A.

Plate 5. Reconstructions of gauze types. *a-c*, Type IV, B. *d*, *e*, Type V gauze. Huaral Viejo. UC 4-7543; detail of allover gauze of Middle period combining several techniques, and enlarged section.

Plate 6. Embroidered gauze fabrics. Middle-period gauze combined with *buratto*. *a*, *b*, Ancon. UC 4-6340; enlargement and natural-size details of child's shirt showing plain gauze and hemstitching. *c*, Supe. UC 4-7506; embroidery in colored wools on plain gauze foundation.

Plate 7. Embroidered gauze, reconstructed technique. Late-period gauze combined with *buratto*. *a*, *b*, Ancon. UC 16-988; detail of embroidery on gauze ground and reconstruction to show method.

Plate 8. Resist-dyed gauze, enlarged detail. Fabric of Late period patterned by resist method. *a*, *b*, Chancay. UC 16-2016; detail natural size and enlargement of one design motive.

Plate 9. Allover gauze fabrics of Late period. *a*, Chancay. UC 16-1081; detail of mantle in Type II gauze; applied border in tapestry and pattern weave; width of band 1½ inches. *b*, Huacho. UC 4-7565b; head veil (¶) in Type II, A gauze; dimensions, 15 by 32 inches.

Plate 10. Allover gauze fabrics of Late period in Type II, A technique. *a*, Ancon. UC 16-972. *b*, Chancay. UC 16-1093.

Plate 11. Allover gauzes, Middle-period textures. *a*, Tunga. UC 4-8441; mauve-colored Type I gauze. *b*, Huaral Viejo. UC 4-7556; sleazy white gauze of indifferent workmanship.

Plate 12. Patterns in gauze technique. Early-period gauzes in Type IV technique. *a*, Cahuachi, Nazca. CNHM 171110; fret repeated as allover motive; length of fret, 5 inches. *b*, *c*, Paracas Caverns. MHN 8457a; heavy fabric as base for allover pattern in gauze.

Plate 13. Patterns in gauze technique. Textures of Middle-period Supe mantles patterned in Type IV gauze. *a*, UC 4-7481k. *b*, UC 4-7481d. *c*, UC 4-7152.

Plate 14. Brocade and gauze; Late-period kerchief combining Type IV gauze and brocaded plain weaves. Ica. UC 4-4991; width of bands, approximately 1 inch.

Plate 15. Allover gauze and gingham of Late period. *a*, Chancay. UC 16-1635; allover in Type IV, A technique. *b*, Ica. UC 4-5473e; gingham in several colors including browns and gray. Striped ½ inch wide.

Plate 16. Allover gauzes. Type IV gauzes of Late period. *a*, *b*, Chancay. UC 16-1650; section of cross-banded gauze fabric and reconstruction to show method of making. *c*, *d*, Chanchan. UC 16-6866b; reconstruction of embroidered (¶) detail in Type IV gauze.

Plate 17. Late-period gauze pattern on plain-weave ground. *a*, *b*, Chancay. UC 16-1637a; reconstruction of section of border with man motive in Type IV, B gauze.

Plate 18. Gauze patterns in plain-weave fabrics. Shirt materials in Type IV, B gauze technique. *a*, Chancay. UC 16-973; child's shirt with needlework border flanked by rows of gauze weave. *b*, Supe. UC 4-7550; detail of sleeve to show fringe of unwoven warp loops. *c*, Chillon. UC 16-1676; pattern in gauze technique on plain-weave ground. *d*, Supe. UC 4-7550a; detail of sleeve to show applied tape fringe. *a*, Late period; *b*, *c*, *d*, Middle period.

Plate 19. Late-period allover gauze combining Types II and III. *a, b*, Ancon. UC 16-978; enlargement and section of cross-barred allover.

Plate 20. Late-period gauzes combining various types of gauze. *a*, Ancon. UC 16-2118; reconstruction showing combination of Types IV and IV, aberrant. *b, c*, Ancon. UC 16-971; fabric and reconstruction showing combination of Types III, IV, IV, B gauzes.

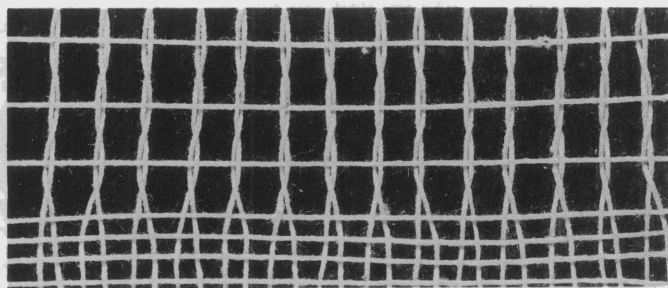
Plate 21. Yarn construction. Enlarged detail of plate 10, *b*, Chancay. UC 16-1093; enlargement showing supertwist given to single-ply yarns employed for gauzes. Late period.

Plate 22. Supplementary techniques. *a*, Ica. UC 16-1499; reconstruction of end-to-end warp lock. *b*, Supe. UC 4-7152; reconstruction of multiple-weft selvage. *c, d*, Chancay. UC 4-6408d; reconstruction of rolled-tape edging fabric with crosslines of gauze weave, Type IV, B. *a, c, d*, Late period; *b*, Middle period.

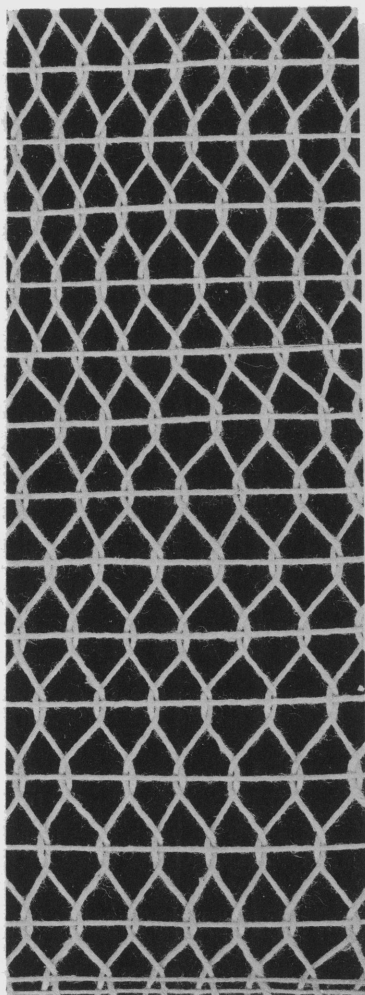
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Arrows by the letters on plates denote the direction of the warp.

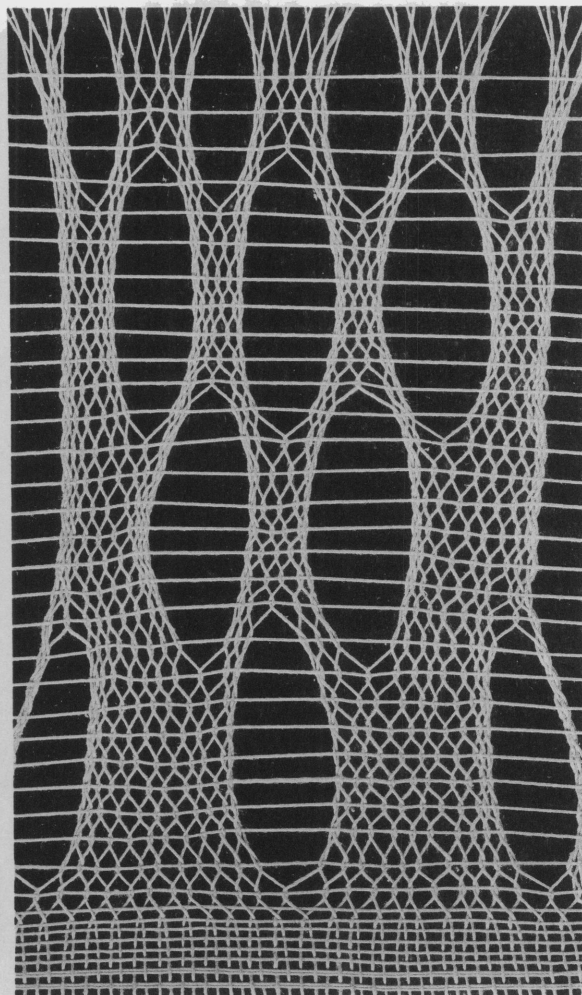
Plate 3. Reconstructions of gauze types. *a*, Type I. *b*, Type II. *c*, Type II, A.



A →



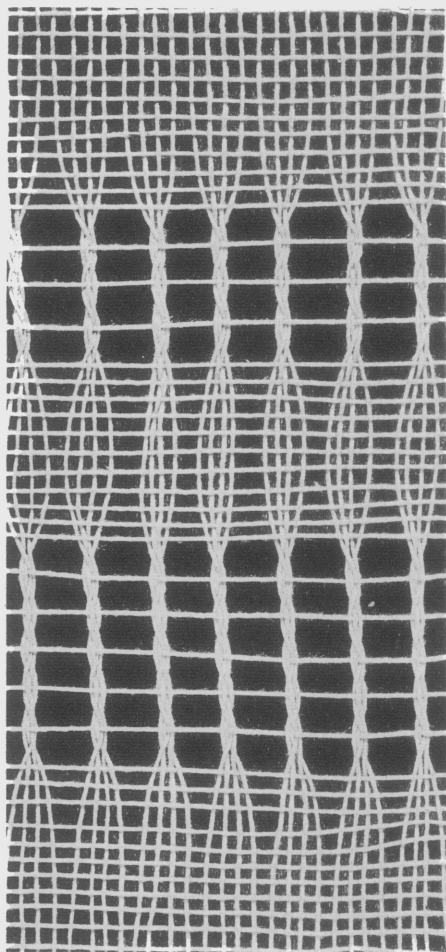
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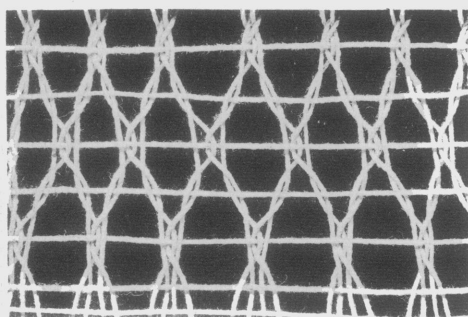
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Reconstructions of gauze types

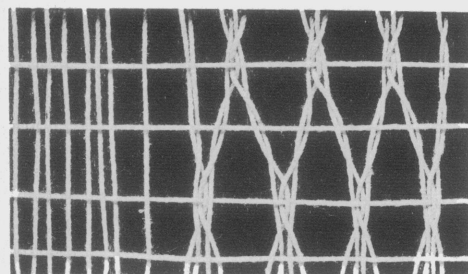
Plate 4. Reconstructions of gauze types. *a*, Type III. *b*, Type IV. *c*, Type IV with plain-weave section. *d*, Type IV, aberrant. *e*, Type IV, A.



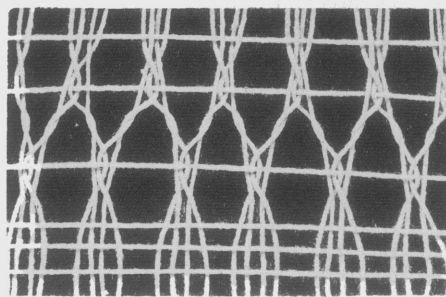
A



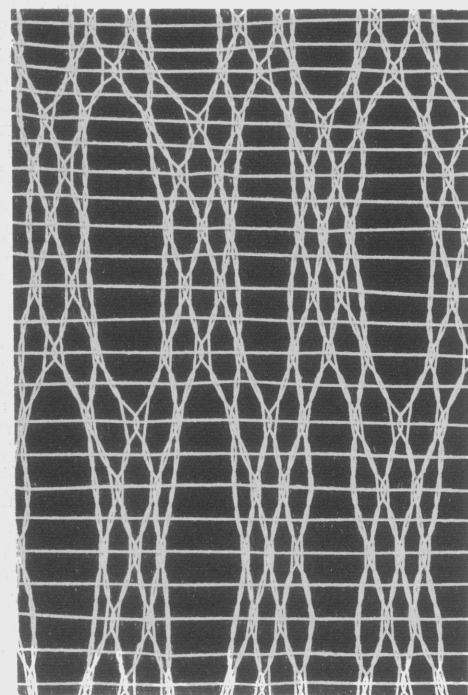
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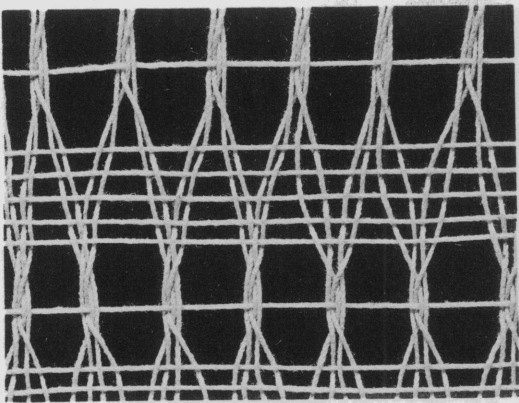
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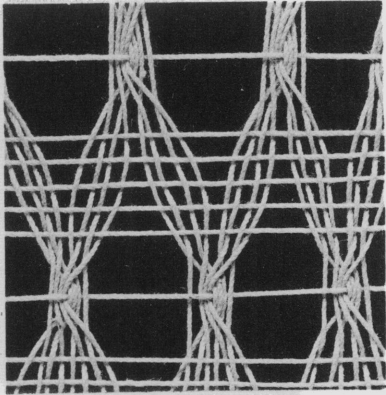
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Reconstructions of gauze types

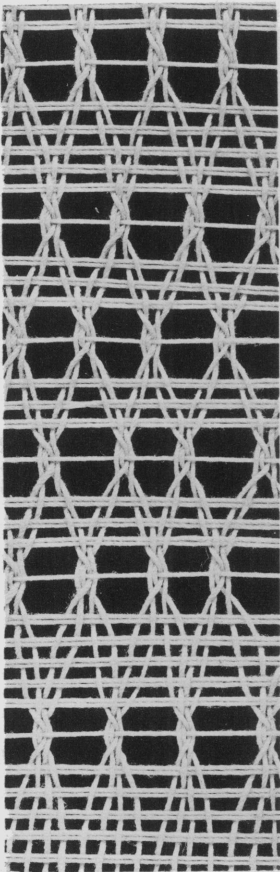
Plate 5. Reconstructions of gauze types. *a-c*, Type IV, B. *d, e*, Type V gauze. Huaral Viejo. UC 4-7543; detail of allover gauze of Middle period combining several techniques, and enlarged section.



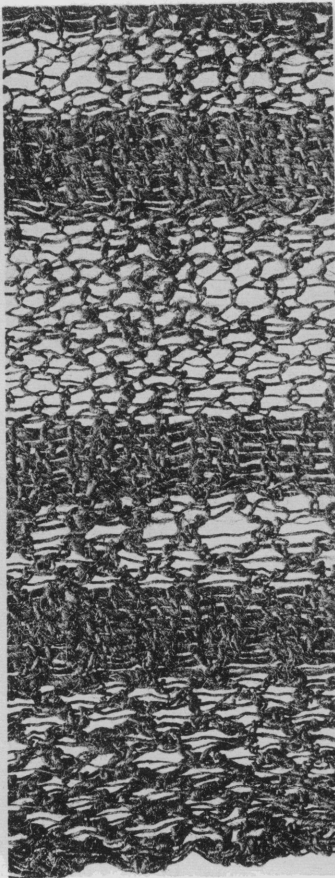
A



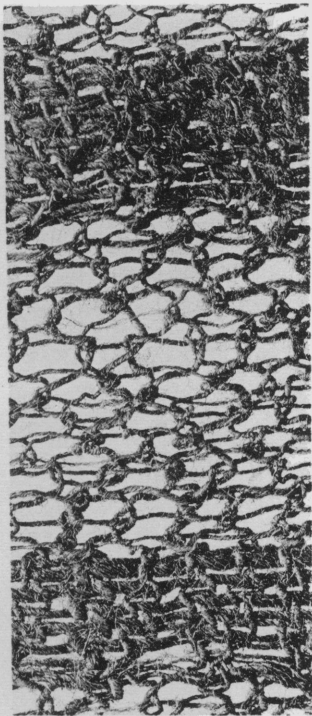
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C



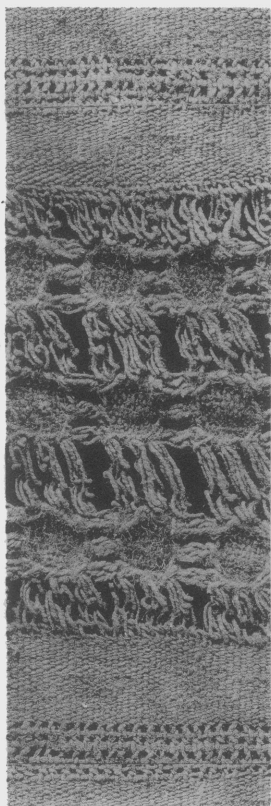
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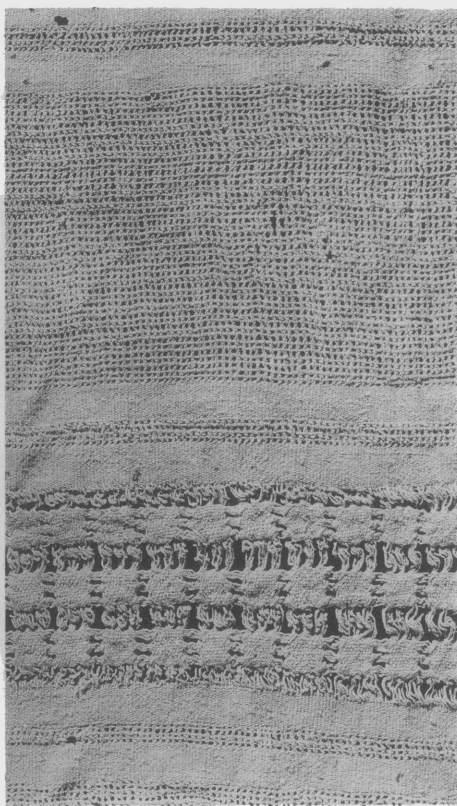
E

Reconstructions of gauze types, gauze fabric, and enlarged detail

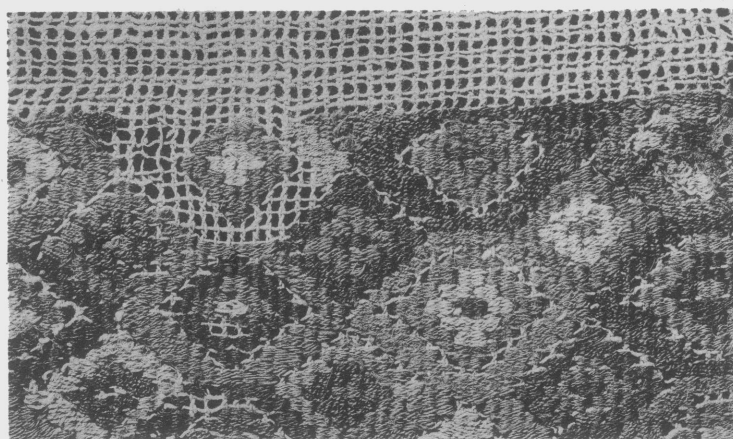
Plate 6. Embroidered gauze fabrics. Middle-period gauze combined with *buratto*. *a, b*, Ancon. UC 4-6340; enlargement and natural-size details of child's shirt showing plain gauze and hemstitching. *c*, Supe. UC 4-7506; embroidery in colored wools on plain gauze foundation.



A



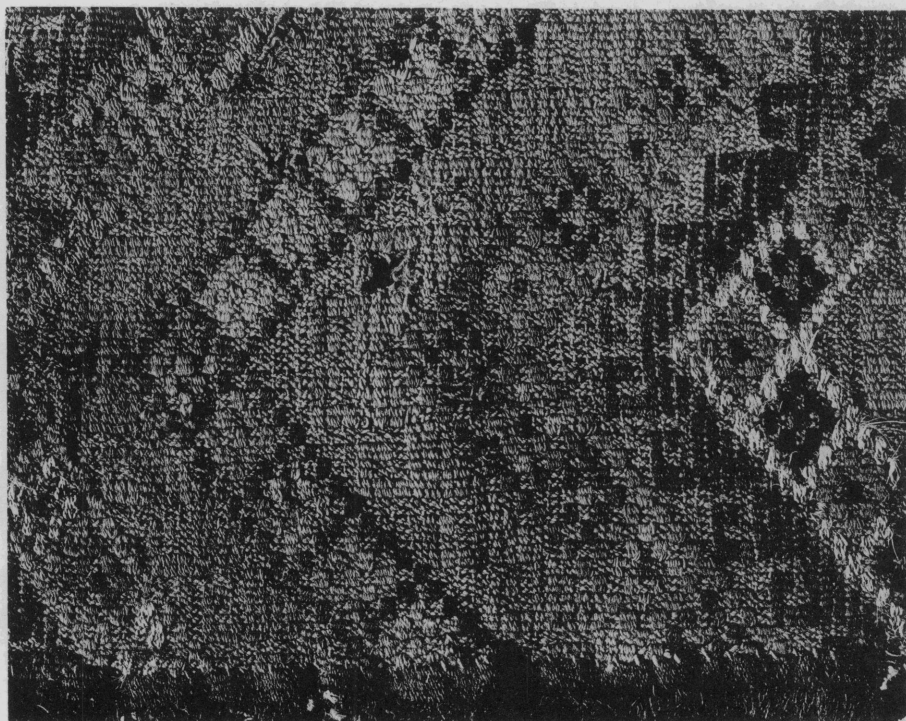
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C

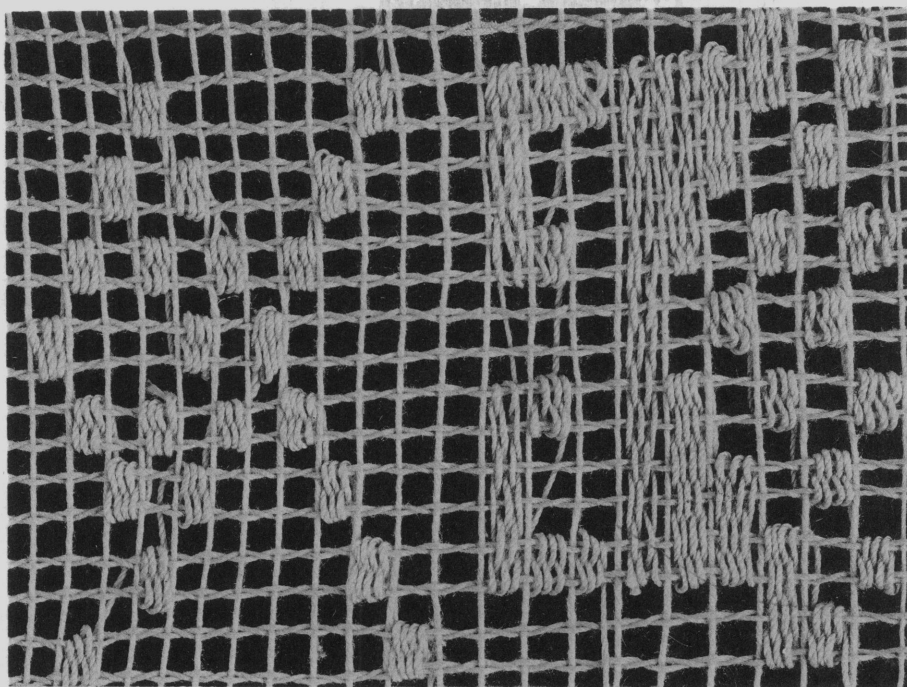
Embroidered gauze fabrics

Plate 7. Embroidered gauze, reconstructed technique. Late-period gauze combined with *buratto*. a, b, Ancon. UC 16-988; detail of embroidery on gauze ground and reconstruction to show method.



A →

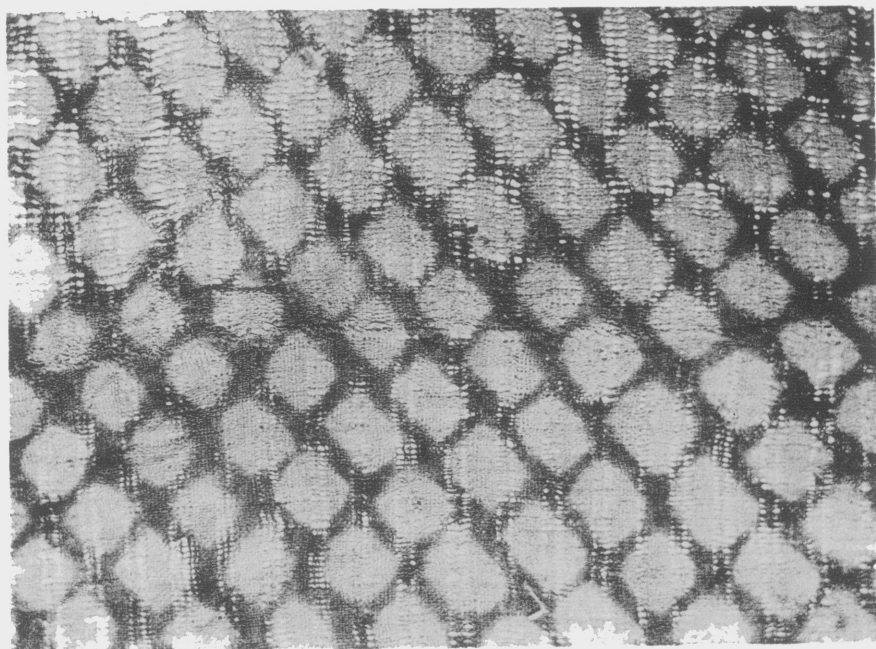
Embroidered gauze and reconstructed technique



B →

Plate 8. Resist-dyed gauze, enlarged detail. Fabric of Late period patterned by resist method. *a*, *b*, Chancaay. UC 16-2016; detail natural size and enlargement of one design motive.

[O'NEALE AND CLARK] PLATE 8



Resist-dyed (?) gauze and enlarged detail

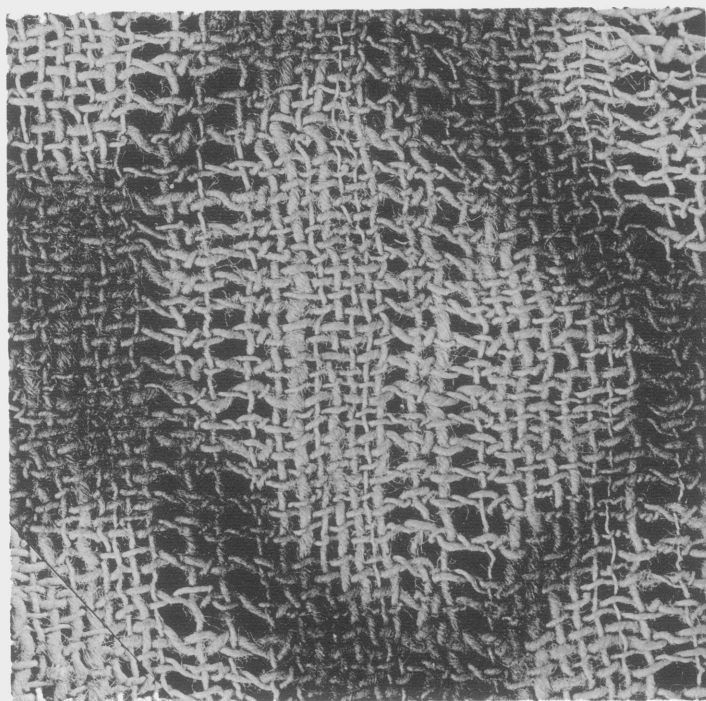
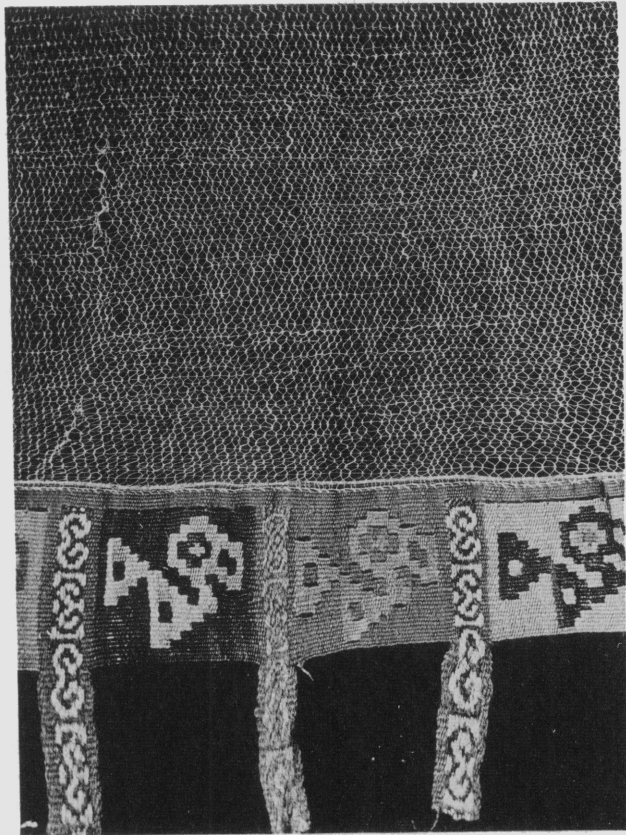
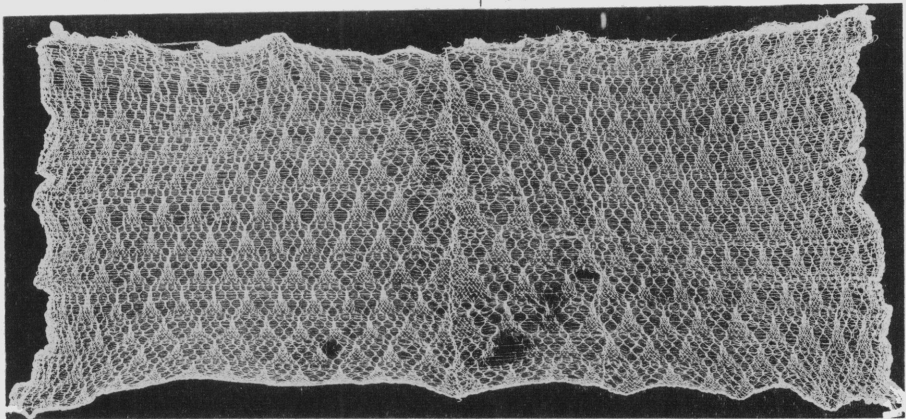


Plate 9. Allover gauze fabrics of Late period. *a*, Chancay. UC 16-1081; detail of mantle in Type II gauze; applied border in tapestry and pattern weave; width of band 1¹ inches. *b*, Huacho. UC 4-7565b; head veil (?) in Type II, A gauze; dimensions, 15 by 32 inches.



↑ A

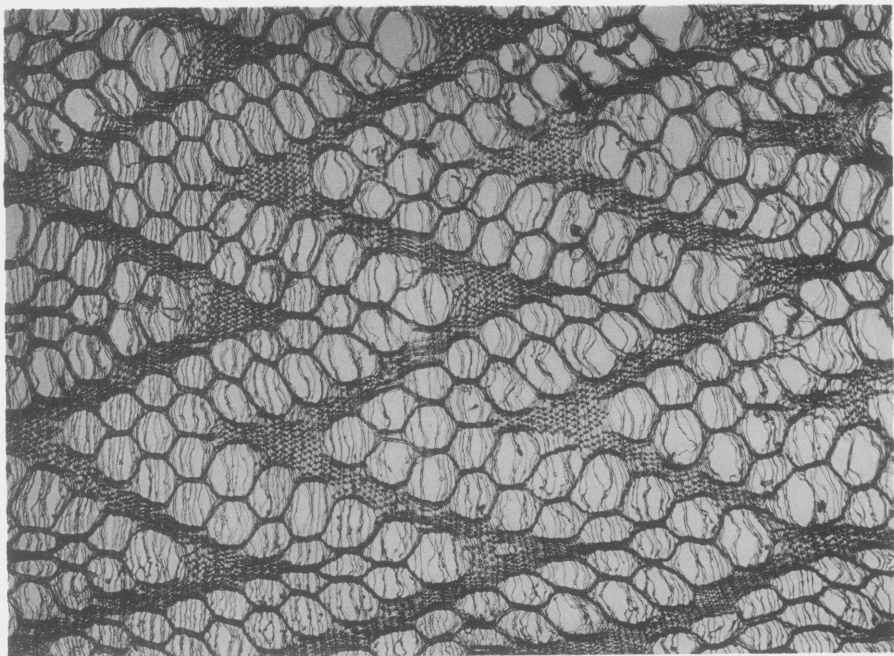


↑ B

Allover gauzes, Late period

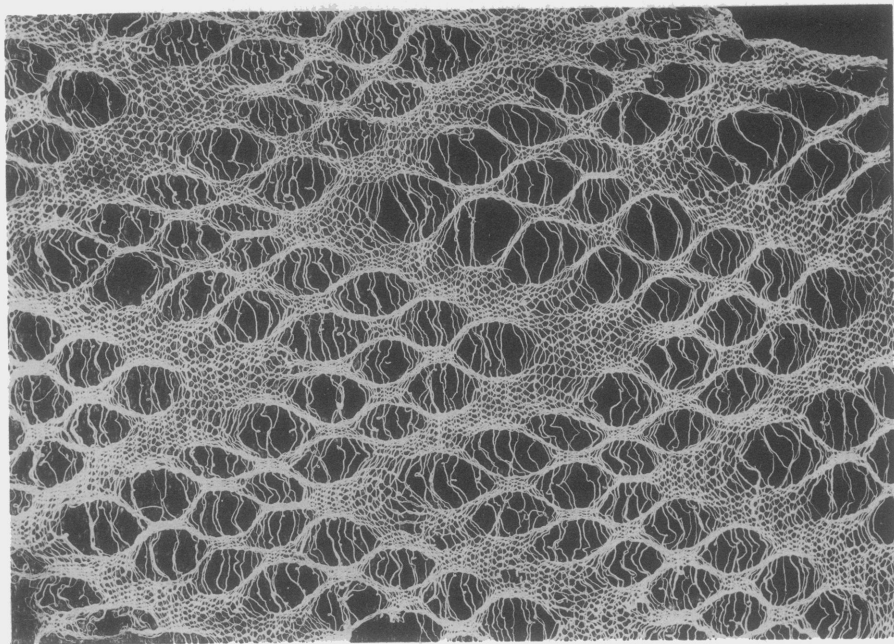
Plate 10. Allover gauze fabrics of Late period in Type II, A technique. *a*, Ancon. UC 16-972. *b*, Chancay. UC 16-1093.

[O'NEALE AND CLARK] PLATE 10



↑ B

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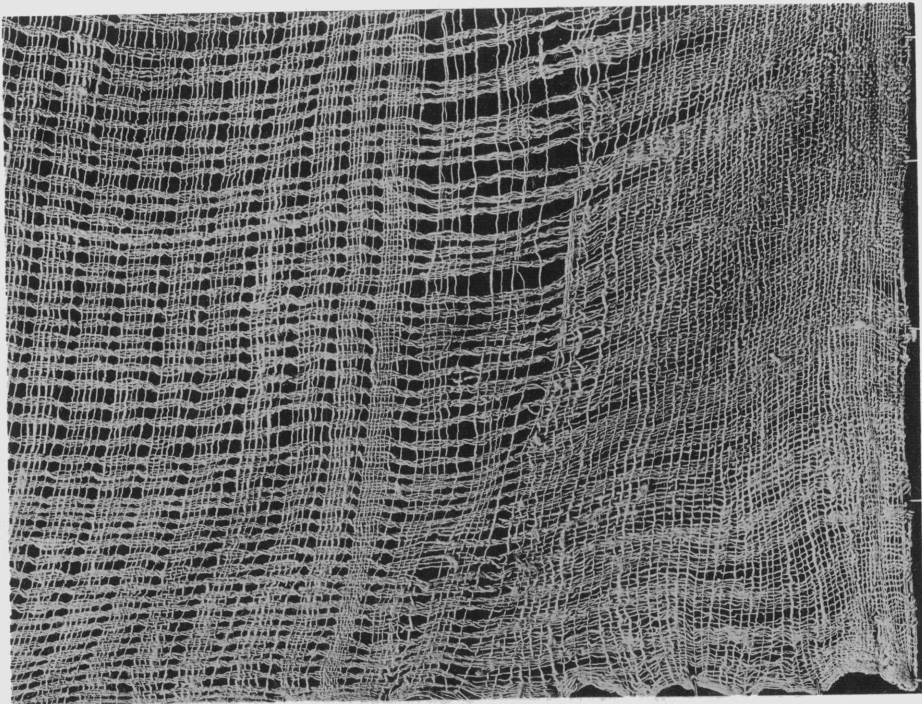


↑ A

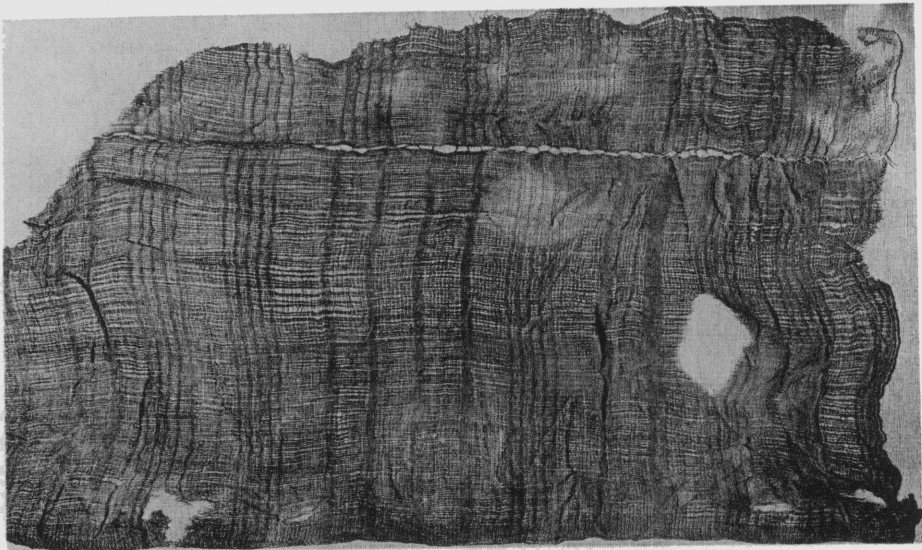
Allover gauze fabric

Plate 11. Allover gauzes, Middle-period textures. *a*, Tunga. UC 4-8441; mauve-colored Type I gauze. *b*, Huaral Viejo. UC 4-7556; sleazy white gauze of indifferent workmanship.

[O'NEALE AND CLARK] PLATE 11

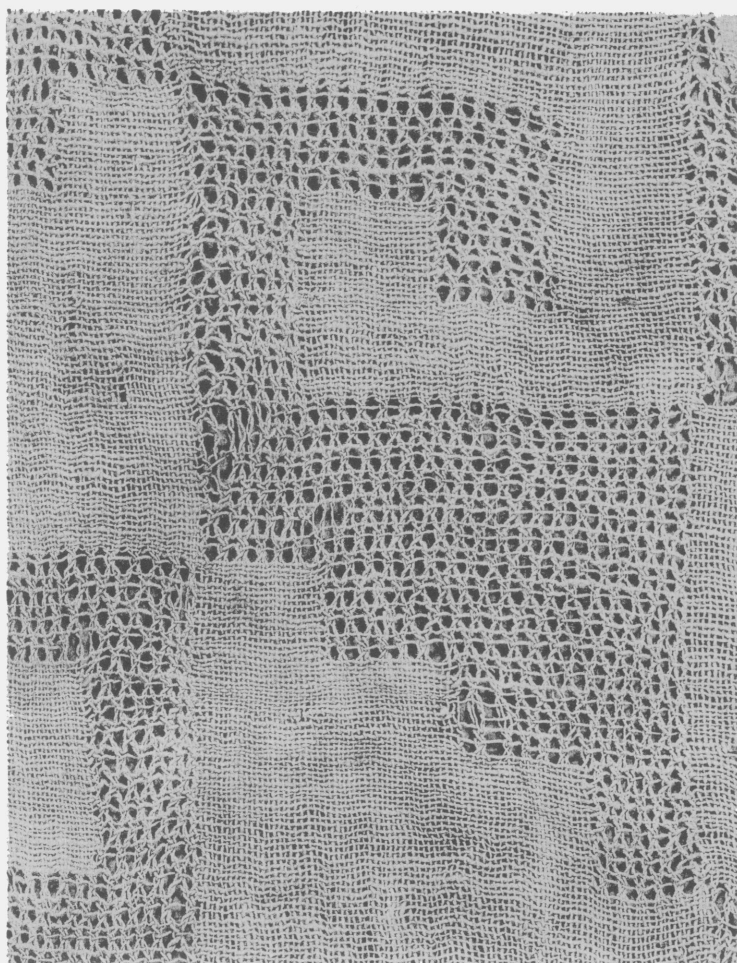


B
↑
Allover gauzes, Middle period

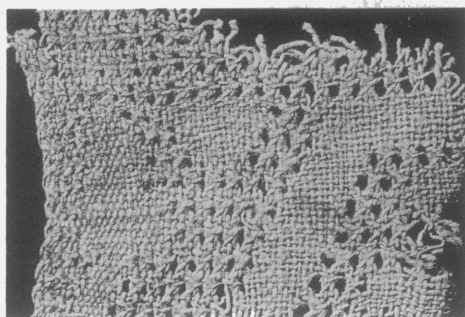


A
↑

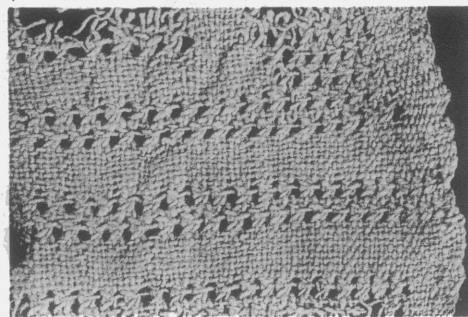
Plate 12. Patterns in gauze technique. Early-period gauzes in Type IV technique. *a*, Cahuachi, Nazca. CNHM 171110; fret repeated as allover motive; length of fret, 5 inches. *b*, *c*, Paracas Caverns. MHN 8457a; heavy fabric as base for allover pattern in gauze.



A ↑



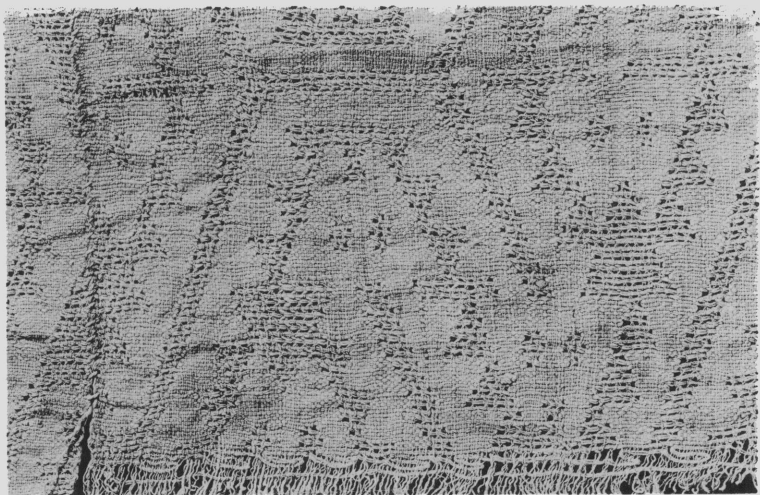
B ↑



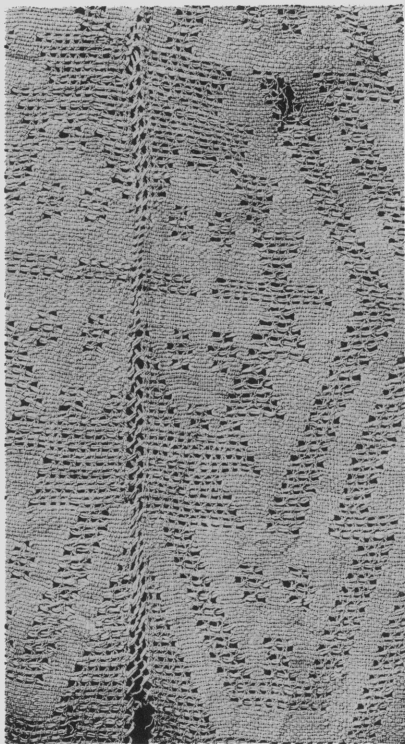
C ↑

Patterns in gauze technique, Early period

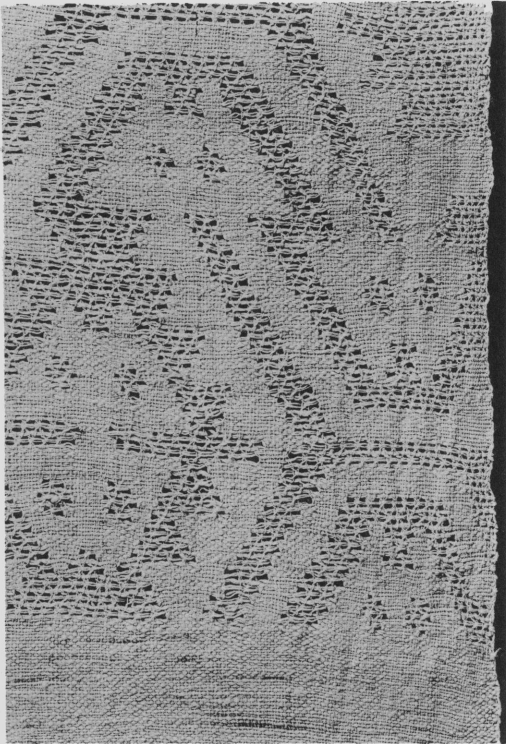
Plate 13. Patterns in gauze technique. Textures of Middle-period Supe mantles patterned in Type IV gauze. *a*, UC 4-7481k. *b*, UC 4-7481d. *c*, UC 4-7152.



A ↑



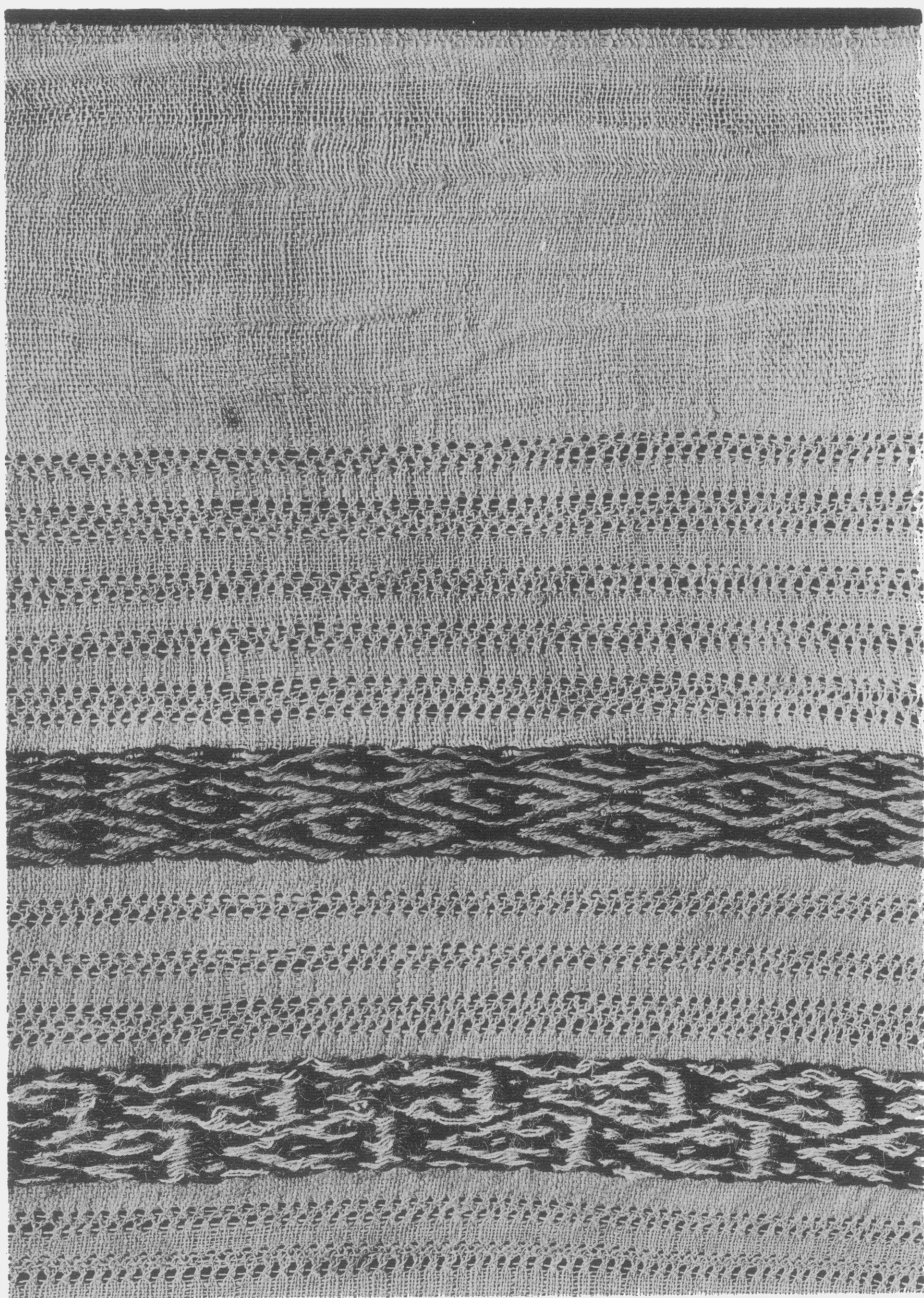
B ↑



C ↑

Patterns in gauze technique, Middle period

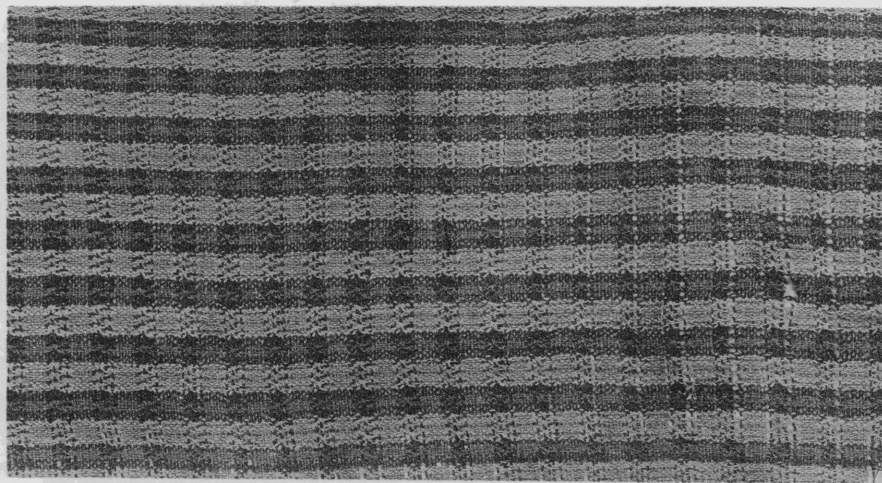
Plate 14. Brocade and gauze; Late-period kerchief combining Type IV gauze and brocaded plain weaves. Ica. UC 4-4991; width of bands, approximately 1 inch.



↑
Brocade and gauze, Late period

Plate 15. Allover gauze and gingham of Late period. *a*, Chancay. UC 16-1635; allover in Type IV, A technique. *b*, Ica. UC 4-5473e; gingham in several colors including browns and gray. Striped $\frac{1}{8}$ inch wide.

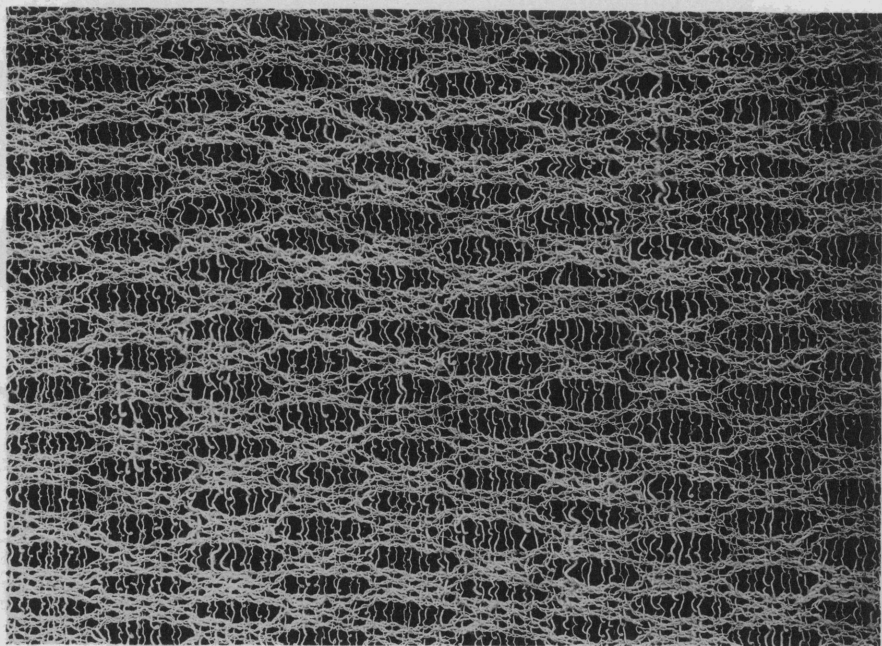
[O'NEALE AND CLARK] PLATE 15



↑ B

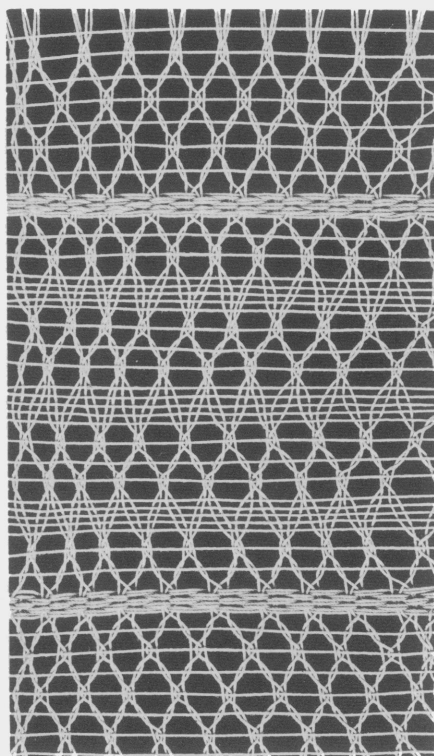
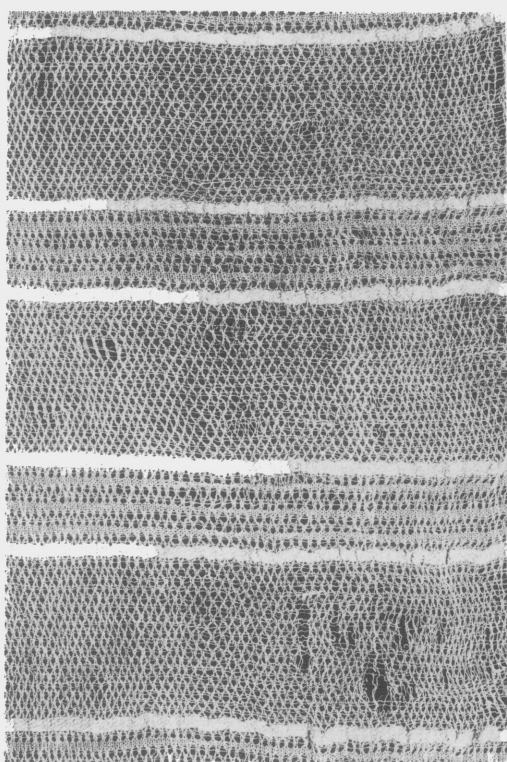
Allover gauze and gingham

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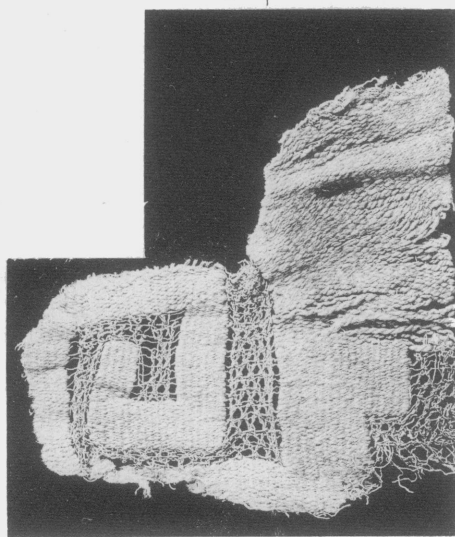
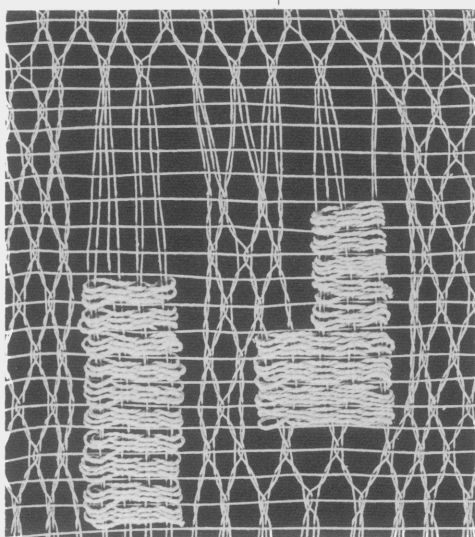
↑ A

Plate 16. Allover gauzes. Type IV gauzes of Late period. *a, b*, Chancay. UC 16-1650; section of cross-banded gauze fabric and reconstruction to show method of making. *c, d*, Chanchan. UC 16-6866b; reconstruction of embroidered (?) detail in Type IV gauze.



A ↑

B ↑



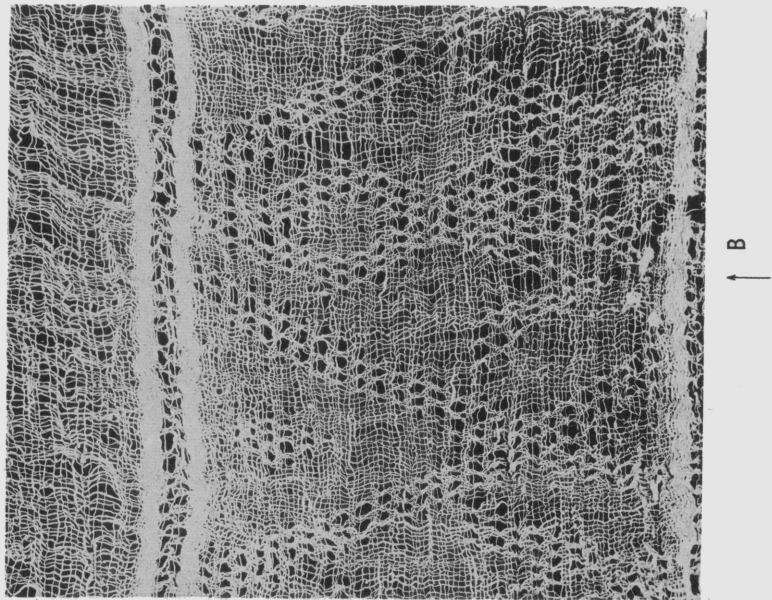
↑ C

↑ D

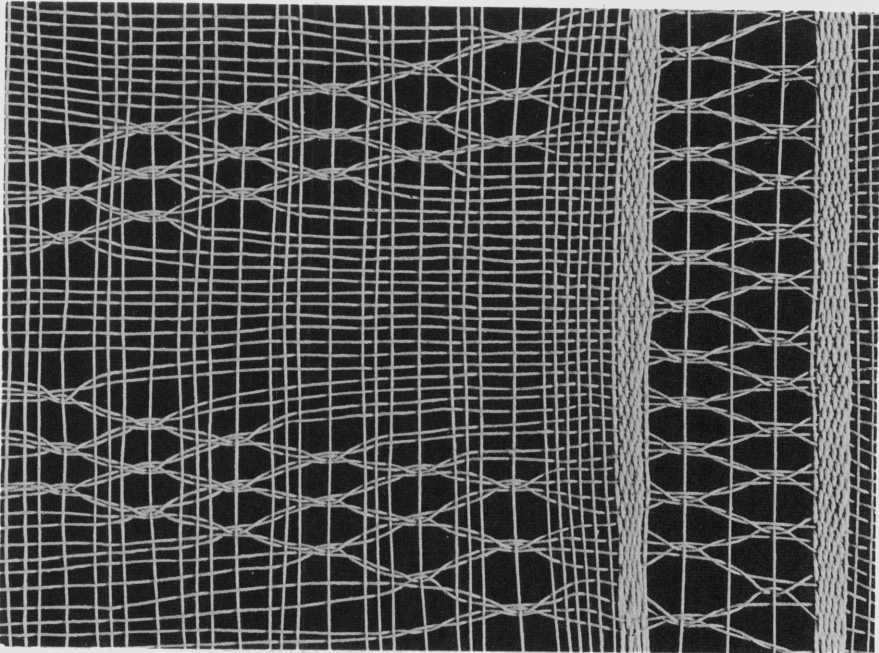
Allover gauzes, Late period, and reconstructed technique

Plate 17. Late-period gauze pattern on plain-weave ground. *a*, *b*, Chancay. UC 16-1637a; reconstruction of section of border with man motive in Type IV, B gauze.

[O'NEALE AND CLARK] PLATE 17

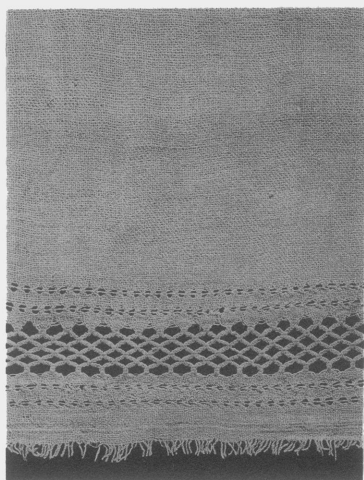


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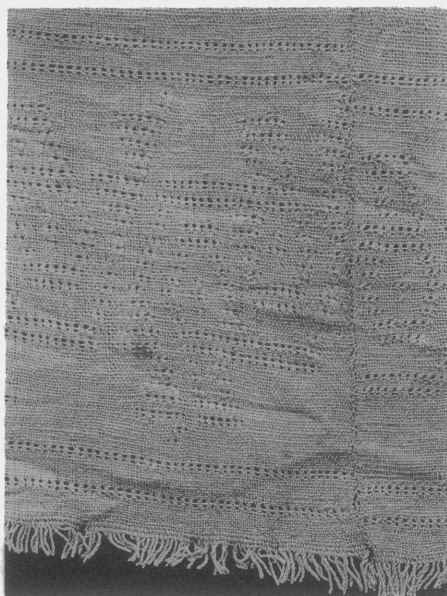


↑ A
Late-period gauze pattern and reconstructed technique

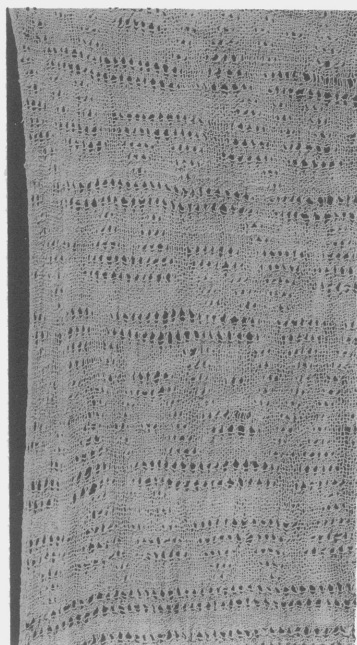
Plate 18. Gauze patterns in plain-weave fabrics. Shirt materials in Type IV, B gauze technique. *a*, Chancay. UC 16-973; child's shirt with needlework border flanked by rows of gauze weave. *b*, Supe. UC 4-7550; detail of sleeve to show fringe of unwoven warp loops. *c*, Chillon. UC 16-1676; pattern in gauze technique on plain-weave ground. *d*, Supe. UC 4-7550a; detail of sleeve to show applied tape fringe. *a*, Late period; *b*, *c*, *d*, Middle period.



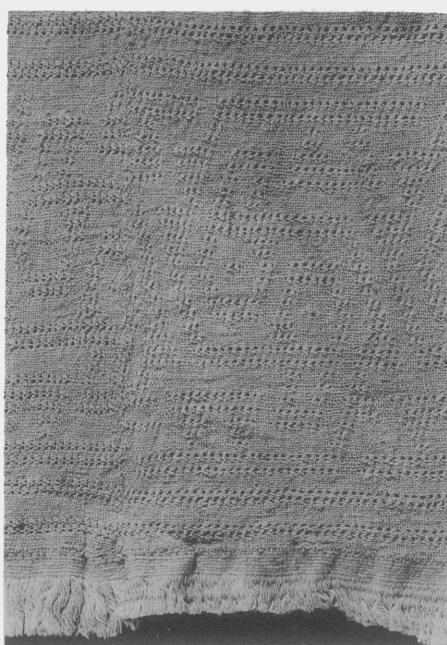
A ↑



B ↑



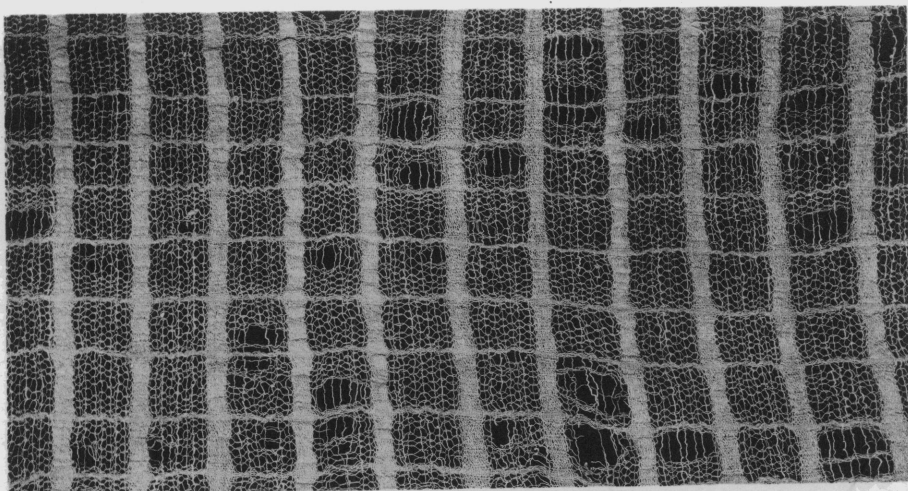
C ↑



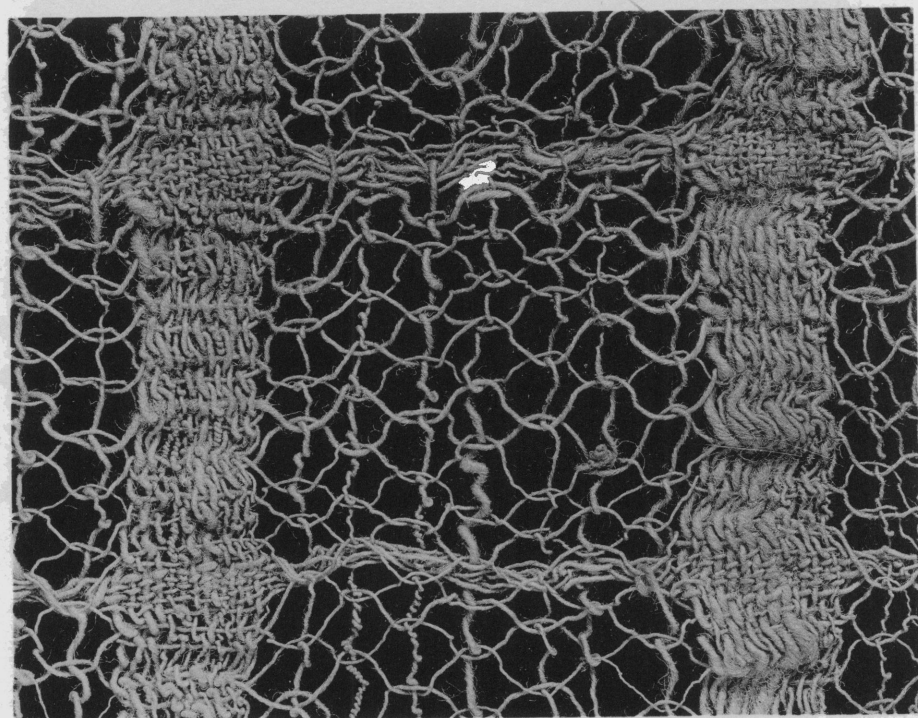
D ↑

Gauze patterns in plain-weave fabric

Plate 19. Late-period allover gauze combining Types II and III. *a, b*, Ancon. UC 16-978; enlargement and section of cross-barred allover.



B ↑

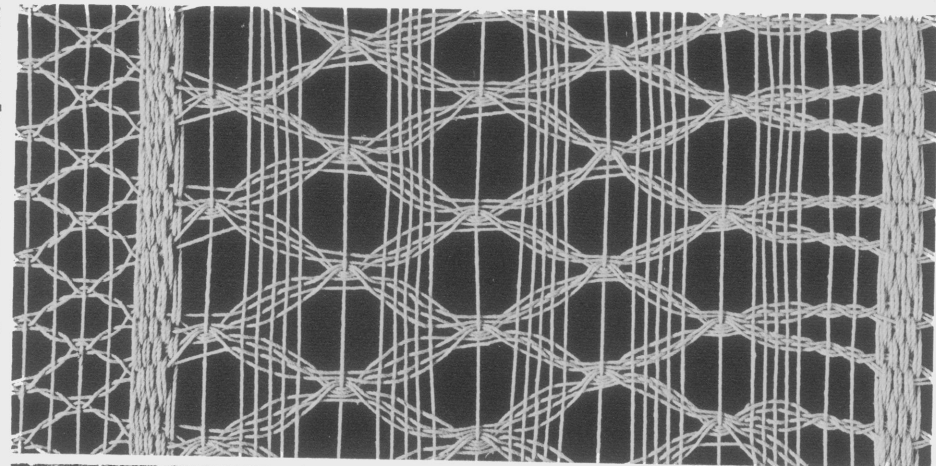


A ↑

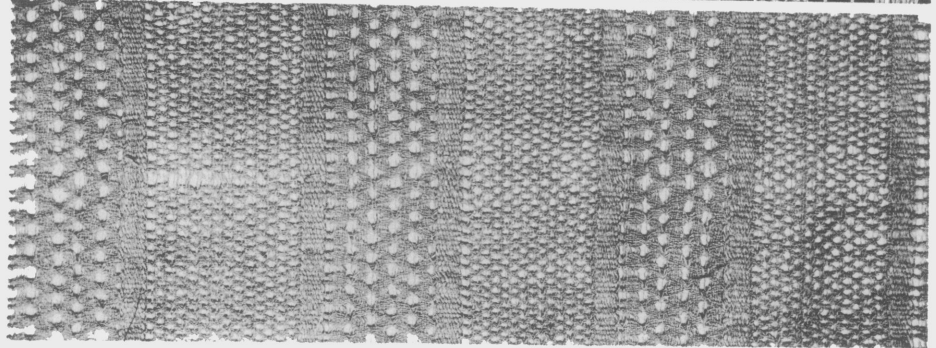
Late-period allover gauze and enlarged detail

Plate 20. Late-period gauzes combining various types of gauze. *a*, Ancon. UC 16-2118; reconstruction showing combination of Types IV and IV, aberrant. *b*, *c*, Ancon. UC 16-971; fabric and reconstruction showing combination of Types III, IV, IV, B gauzes.

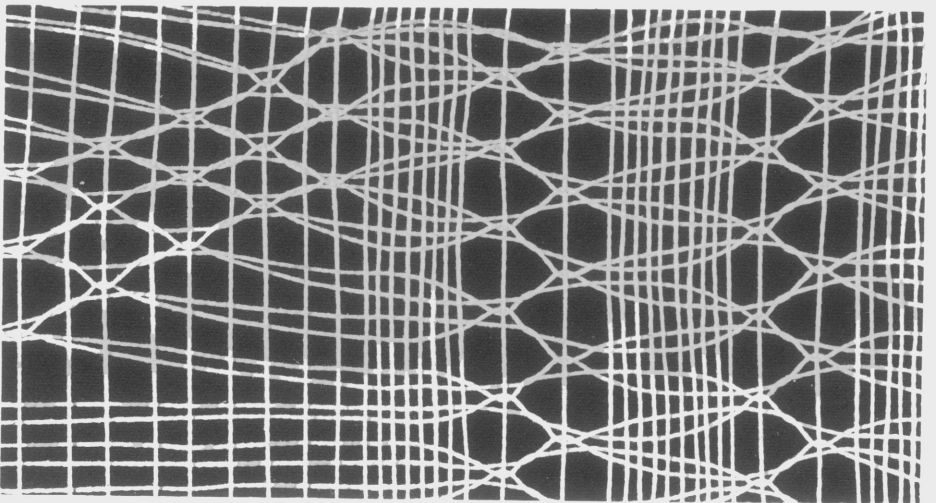
[O'NEALE AND CLARK] PLATE 20



C ↑

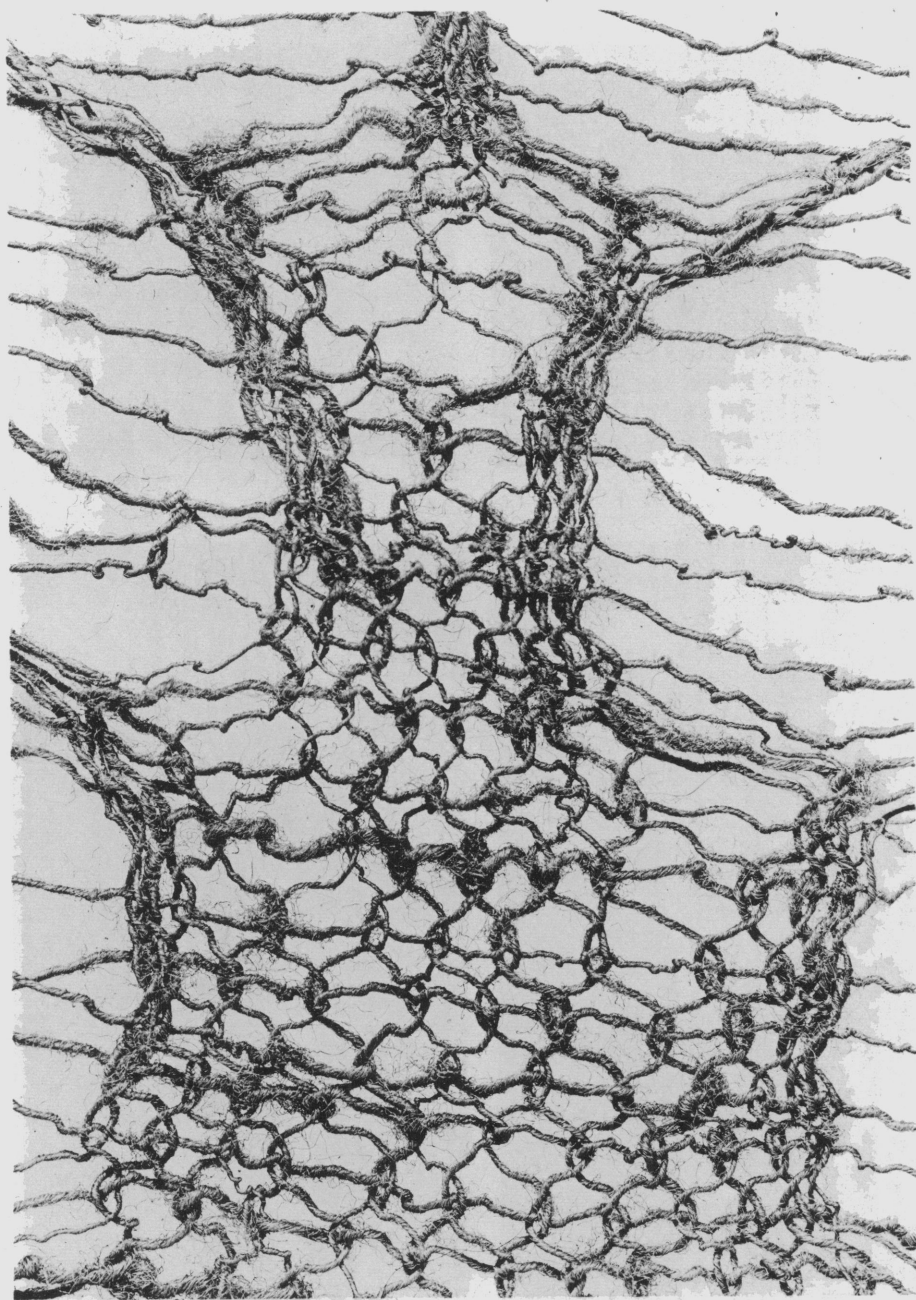


B ↑



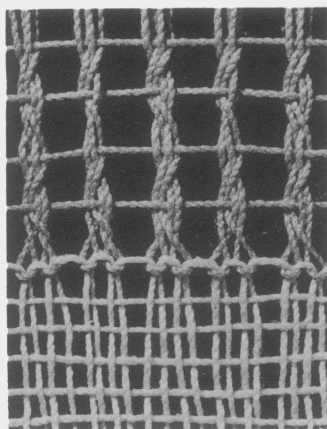
A ↑

Plate 21. Yarn construction. Enlarged detail of plate 10, *b*, Chancay. UC 16-1093; enlargement showing supertwist given to single-ply yarns employed for gauzes. Late period.

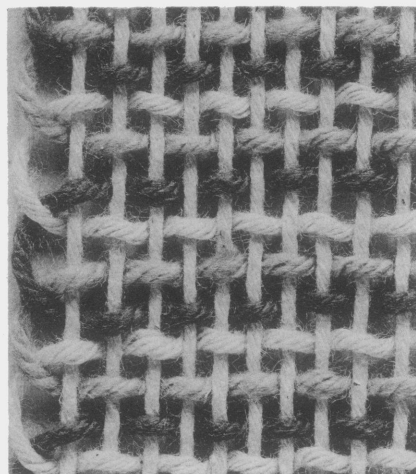


Yarn construction. Enlarged detail of plate 12, *b*

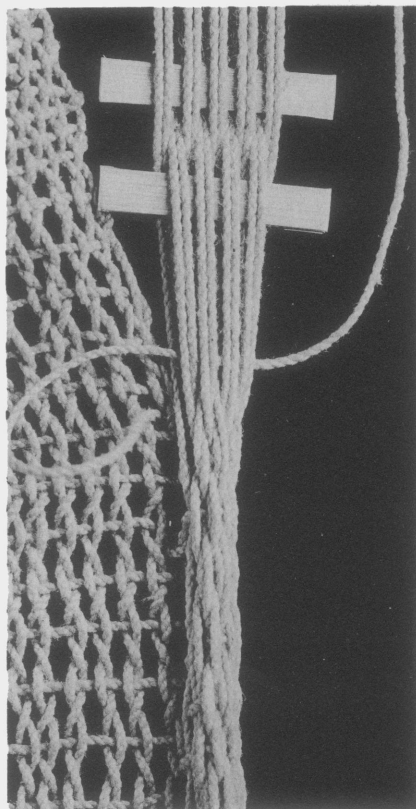
Plate 22. Supplementary techniques. *a*, Ica. UC 16-1499; reconstruction of end-to-end warp lock. *b*, Supe. UC 4-7152; reconstruction of multiple-weft selvage. *c*, *d*, Chancay. UC 4-6408d; reconstruction of rolled-tape edging fabric with crosslines of gauze weave, Type IV, B. *a*, *c*, *d*, Late period; *b*, Middle period.



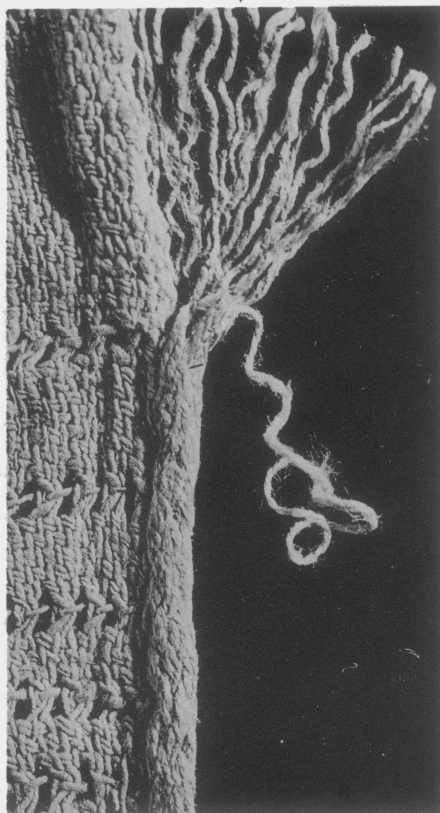
A ↑



B ↑



C ↑



D ↑

Supplementary techniques, reconstructions; rolled-type edge finish