

SCHOOL OF DESIGN
STUDENT PUBLICATION

REFATORY NOTE:

Because of mechanical difficulties, release of Volume 24 (1975) has been delayed until this time. Our apologies for any inconveniences this delay has caused.

Staff of THE STUDENT PUBLICATION (1977-1978)

ERRATA AND ACKNOWLEDGMENTS

Denis Wood's MAKING SEEN

A complete list of errata would be almost as long as the paper itself. For the failure to indicate italics in the body of the text proper, errors in punctuation that obscure meanings, incredible misspellings, and others, apologies are tendered.

Most of the photographs were taken by the San Cristobaleno photographer, Kramsky, with the following exceptions:

Page 45 — Thomas Koch

Pages 51, 52, and 53 — Joaquin Hernanz Humbrias

Page 73 — Staff photographer of the Museum fur Volkerkunde, Basel, Switzerland

Page 79 — A student in the School of Design

Thanks are extended to all these for the use of their photographs here.

The drawings were done in the School of Design by the editors. The map is redrawn from that in Volume 7 of "The Handbook of Middle American Indians." The sketches on pages 88 and 89 are drawn from those in O'Neale's "Textiles Highland Guatemala." The other sketches were done by the editors from the costumes in the collection of the author. Their insufficiencies are lamented.

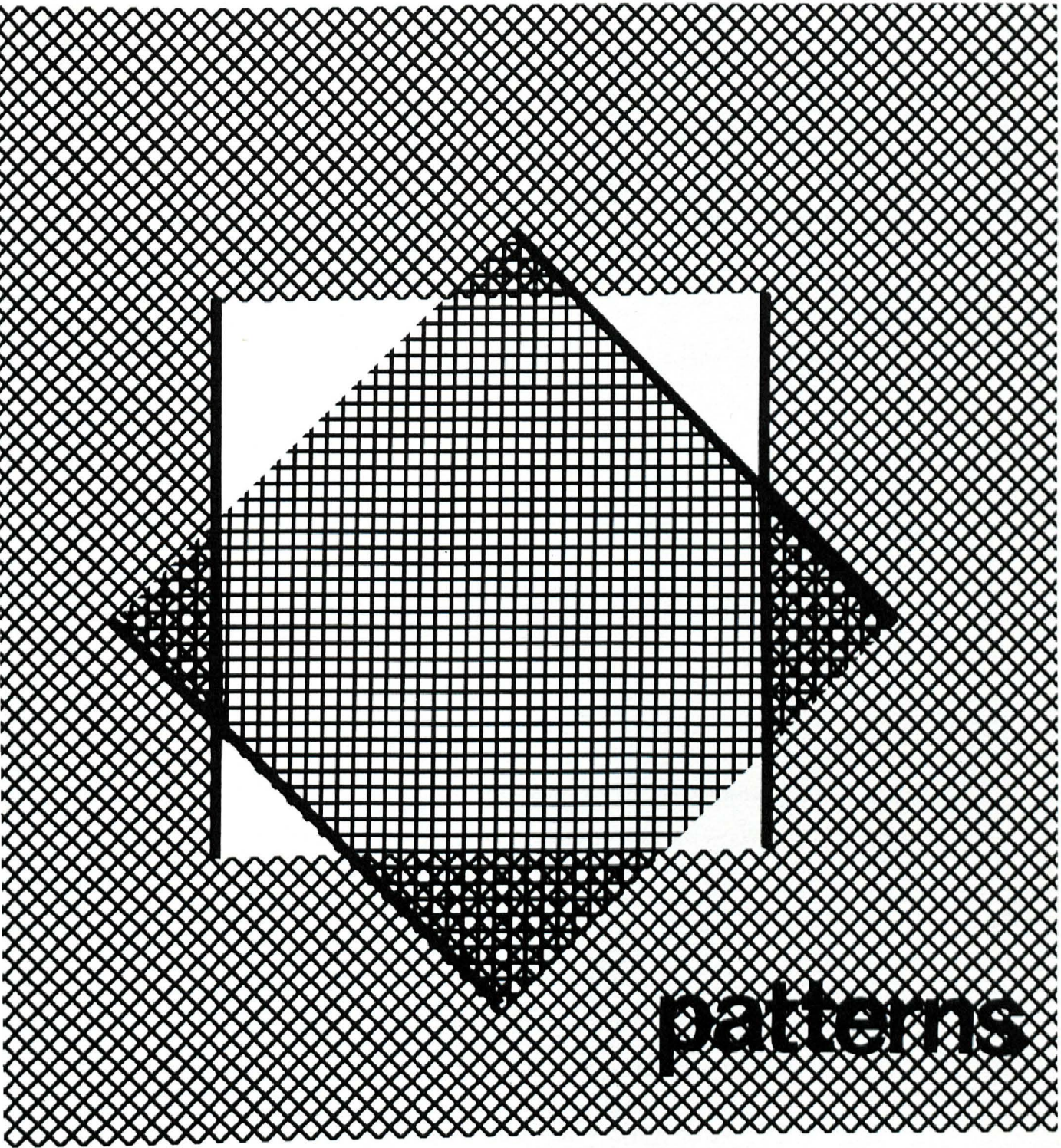
The costume discussed on pages 76-78 is highly similar to that illustrated on page 73, which is in the collection of the Museum fur Volkerkunde in Basel. The lack of captions to the other illustrations is regretted.

Finally, certain deletions to Note 2 appearing on page 107 must be restored. The fourth sentence should read:

"In the unduly famous collection at Na Bolom the emphasis was on their, justly renowned, collection of Lacandon artifacts."

The final sentence, entirely omitted in this printing, should read:

"This paper is dedicated to Joaquin Hernanz Humbrias."



patterns

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Denis Wood

to JAN HERLOCKER

a good friend and a good designer who taught us to love patterns

PATTERNING

CAROLYN NELSON

Pattern, structural or applied, functions as a visual element enriching surface and form. Whether sophisticated mathematical configuration or loosely designed primitive crafts, pattern is structure composed of an image or motif repeated in a specific order.

Repetition implies order and system, lending itself easily to mass production. The designer must be aware of the unique possibilities and limitations of mechanical systems of pattern production whether they involve fabric forming, printing, moulding, cutting, or a number of other methods. Considerations must be made in terms of size, shape, position of repeating units, the form and area of the total product and, the axis and stability of construction. Properties of the materials to be used, and other variables such as the possible number of values, colors, or textures, must also be considered.

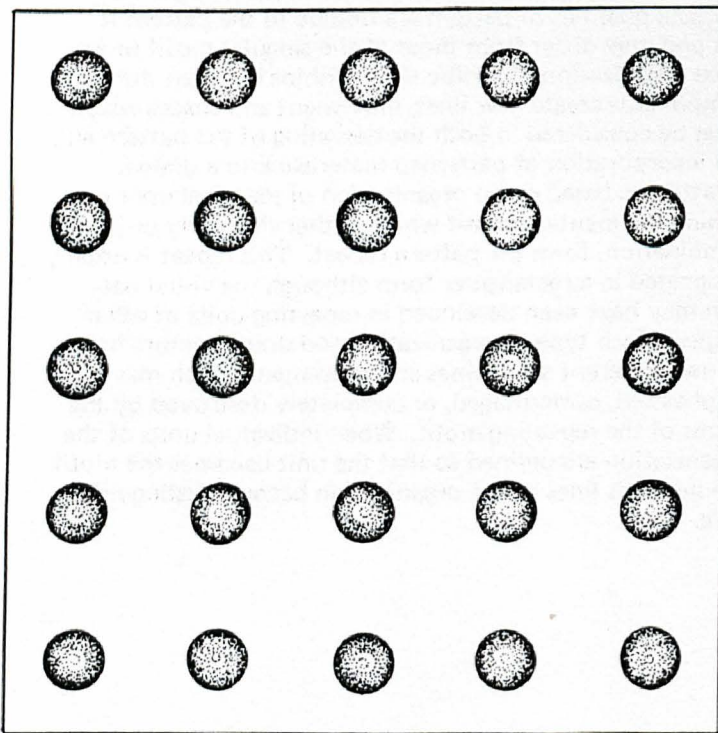
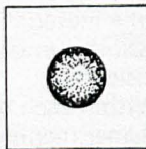
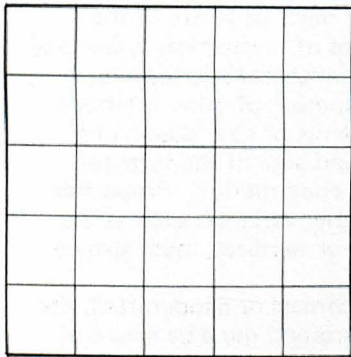
Within each design situation, technical or handcrafted, the designer manipulates visual elements and must be aware of basic principles of pattern development and design.

Visual qualities of pattern are unique to the pattern itself and may differ from those of the singular motif or isolated organization. Specific relationships between the two components create new lines, movement and spaces which must be considered in both the designing of the pattern and the incorporation of patterned materials into a design.

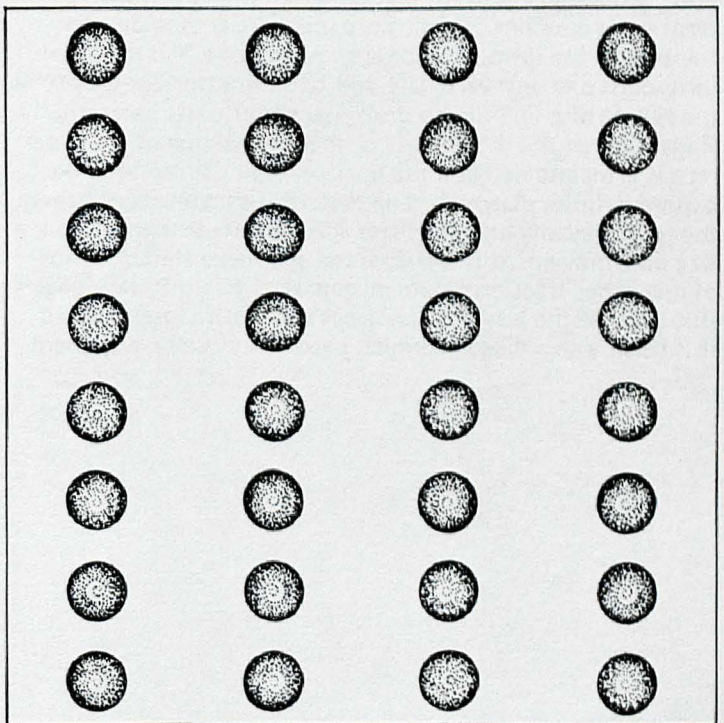
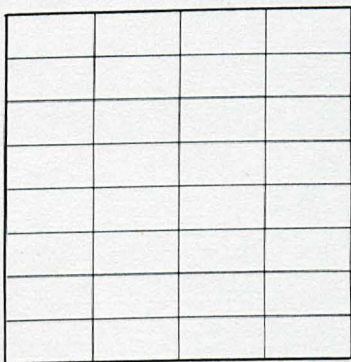
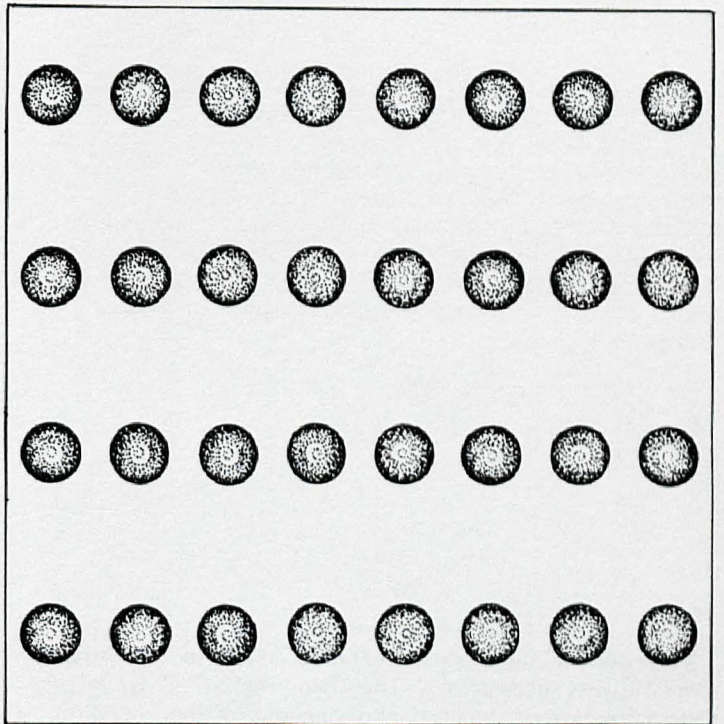
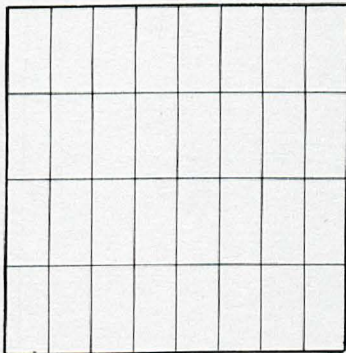
Pattern is based on an organization of identical units containing the identical motif which, either singularly or in combination, form the pattern repeat. This repeat is usually designated in a rectangular form although the visual pattern may have been developed in repeating units of other shapes. Each type of organization and unit structure has its own inherent set of lines and movement which may be emphasized, camouflaged, or completely destroyed by the forms of the repeating motif. When individual units of the organization are defined so that the unit becomes the motif the inherent lines of the organization become distinguishable.

BLOCK REPEAT

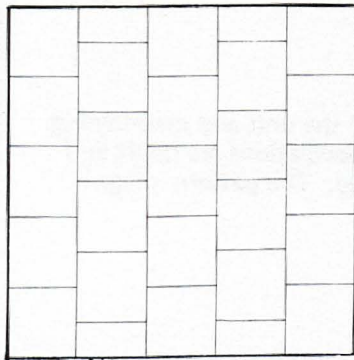
The most direct and most common order is the block repeat, in which each unit is a complete pattern repeat. Square or rectangular units are structured in straight, horizontal and vertical rows. If a motif without strong directional movement or one which distributes movement evenly in all directions is introduced within the framework, horizontal and vertical rows are equally apparent as well as a possible diagonal.



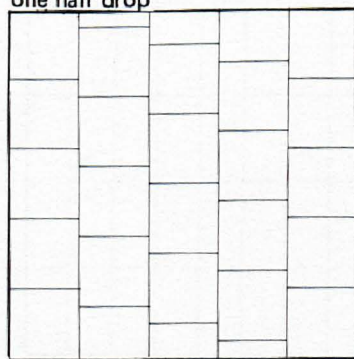
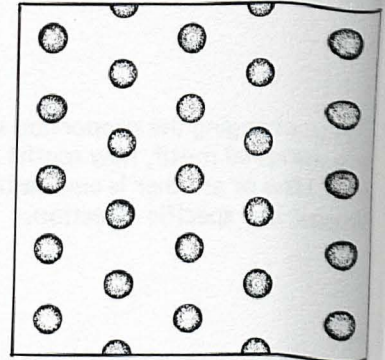
By changing the proportion of the unit and maintaining the original motif, new spatial associations are made and one line or another is emphasized. The pattern image is linear in a specific direction.



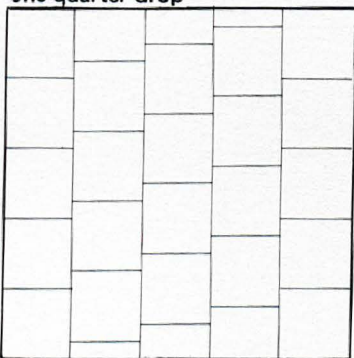
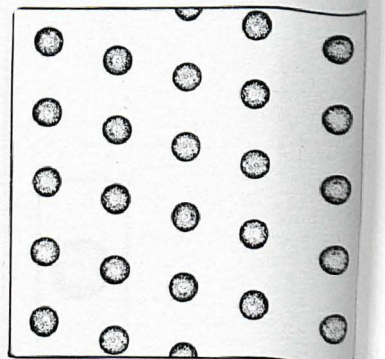
Variations of the block repeat may be created by shifting rows of units successively. The "drop repeat" shifts vertical rows a fraction of the vertical dimension of the preceding unit. Although the motif is repeated in each unit, the pattern repeat contains two or more units depending on the fraction of the drop. The pattern repeat of a half drop pattern spans one unit vertically and two units horizontally while the repeat of a one-fourth drop spans four units horizontally. Regardless of the drop fraction, the vertical line of the block repeat is maintained and the horizontal line is replaced by a more definite diagonal. The half drop square distributes the motifs evenly and equalizes space. Rather than emphasize line, movement is less directed and more static. Drops of any other fraction create diagonals of two different angles. But because the lesser slope places the motif closer spatially, it is usually this diagonal which becomes visually dominant.



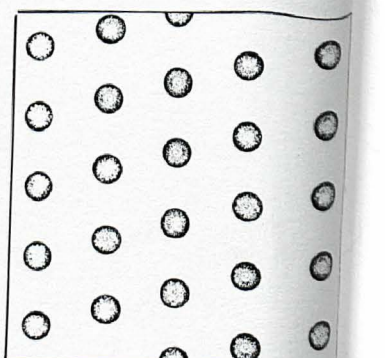
one half drop

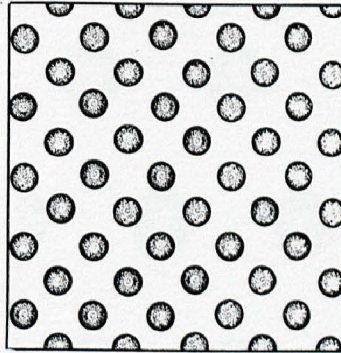


one quarter drop

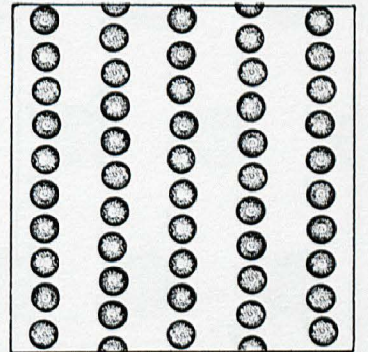


three quarter drop

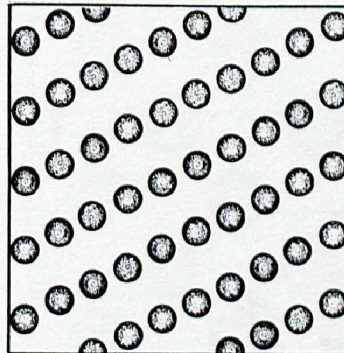




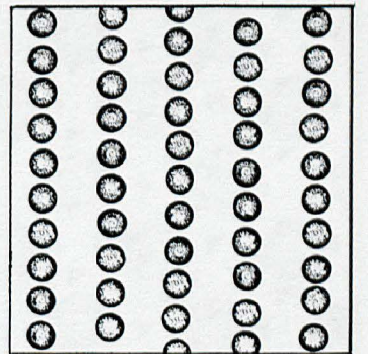
1/2 drop vertical proportion unit



1/2 drop horizontal proportion unit



3/4 drop vertical proportion unit



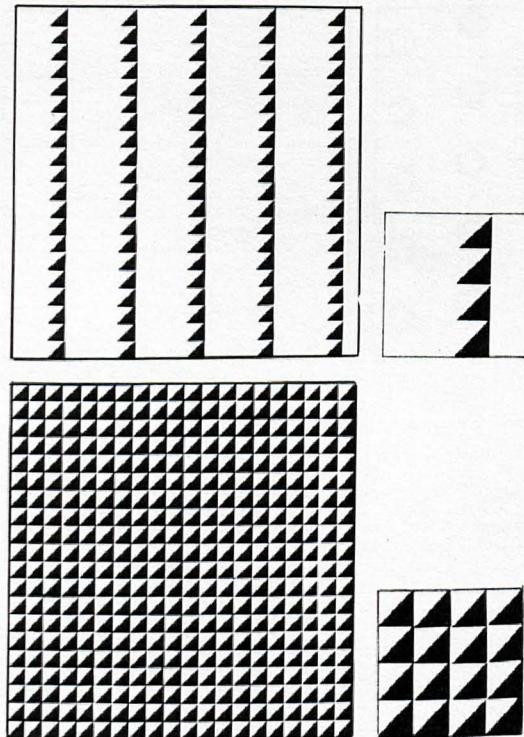
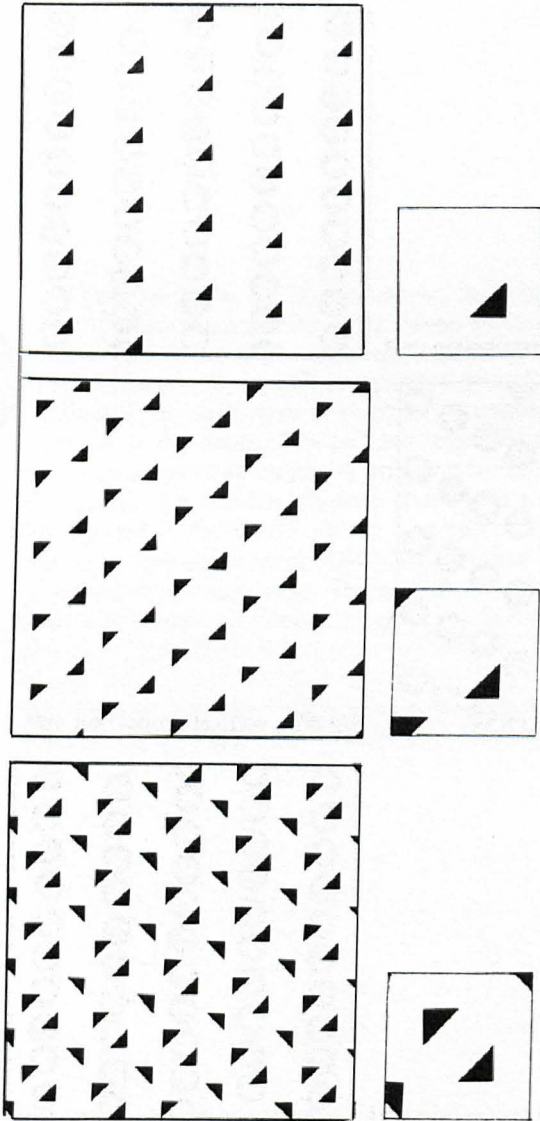
3/4 drop horizontal proportion unit

By changing proportions of the units, the dominance of line may be manipulated. For a one half drop, the 45 degree angle may increase or decrease, but the angles of both diagonals are equal. Neither is emphasized. The vertical line, however may become dominant.

LOW SLOPING DIAGONALS

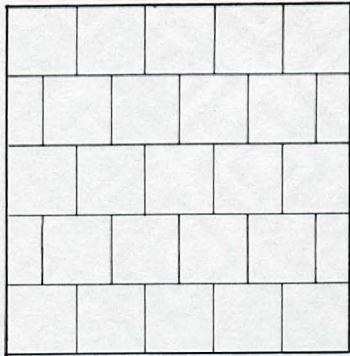
Low sloping diagonals often are difficult to use in any situation which requires regularity. The angle appears more like an off-grain horizontal line rather than a definite diagonal. If use of the drop repeat is necessary for product construction, a multiple number of images within the unit may be used to change the visual lines. A second motif may be placed so as to emphasize the steeper diagonal or random and non-linear movement. By adding the identical figure to each horizontal drop fraction of the unit, a vertical line is defined. Or by adding figures in each fraction of the unit divided horizontally and vertically, a smaller block repeat is formed. In both of the latter situations, the diagonal is completely destroyed when all figures are identical.

Continuous patterns may be developed within frameworks based on non-rectangular units. They may be produced as separate units and pieced together or converted by combining units into a block pattern repeat for yardage production. In these more specialized formats, the shape of the motif usually conforms more closely with that of the unit.

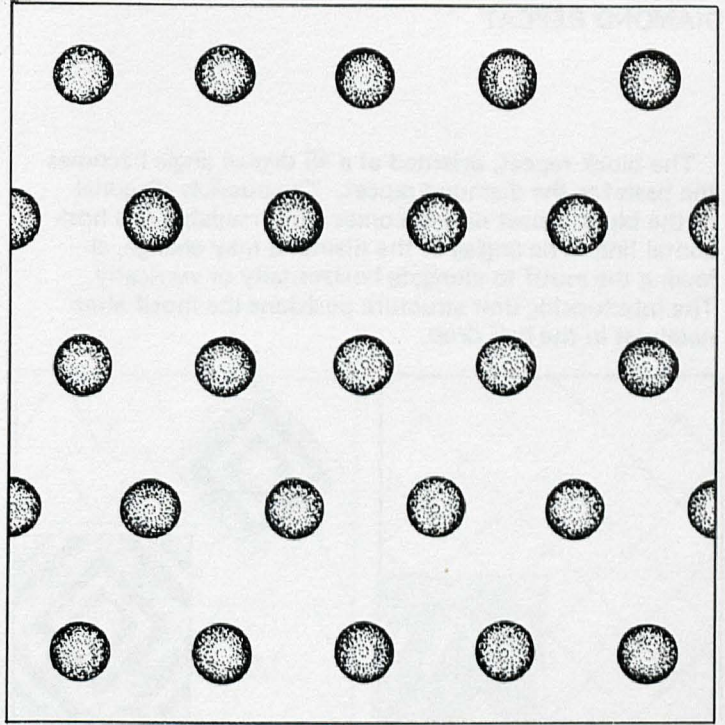
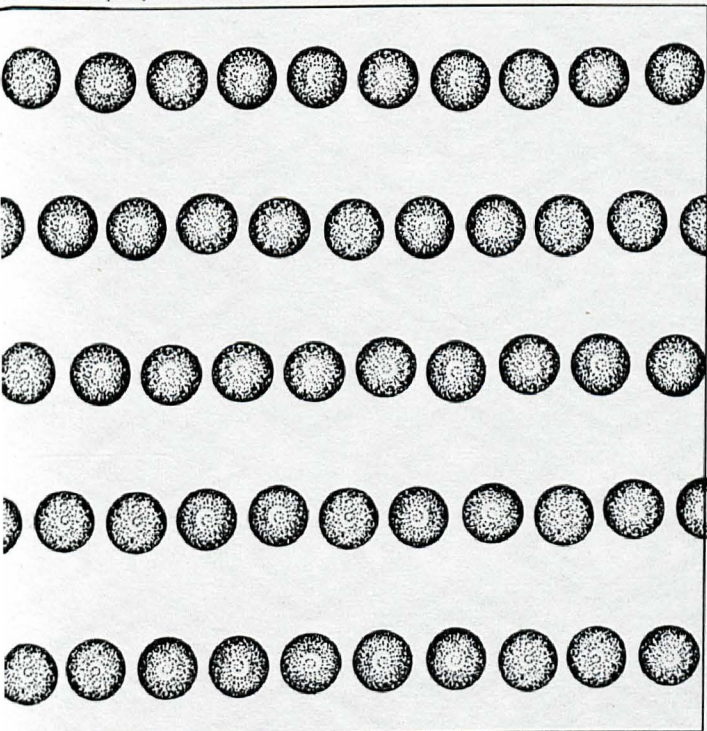


BRICK REPEAT

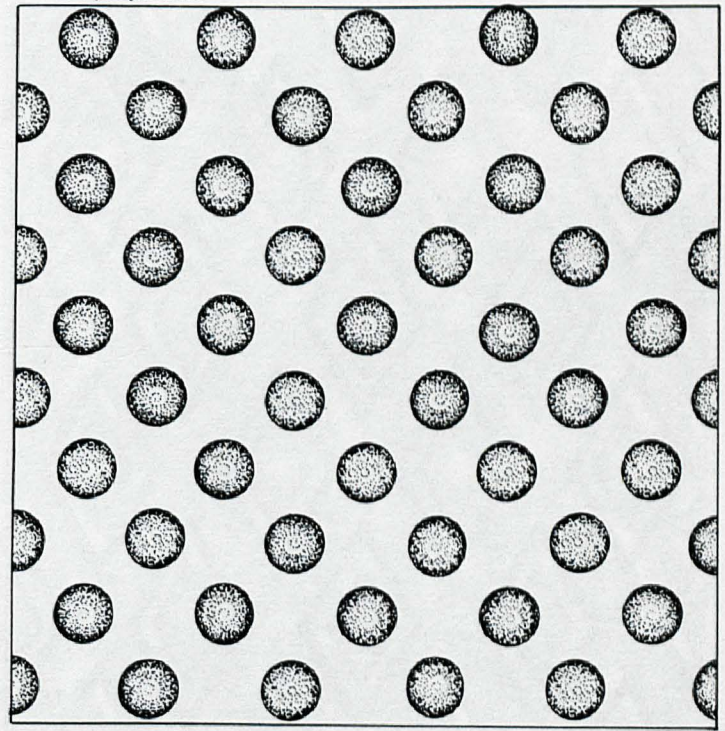
The brick repeat is created by shifting horizontal rows of the block repeat therefore retaining the horizontal line and replacing the vertical line with a diagonal. The same principles of changing and manipulating pattern line as applied to the drop repeat apply to the brick repeat. However, because we are strongly oriented to recognition of horizontal line it becomes more difficult to conceal while still retaining any diagonal movement within the pattern.



horizontal proportion

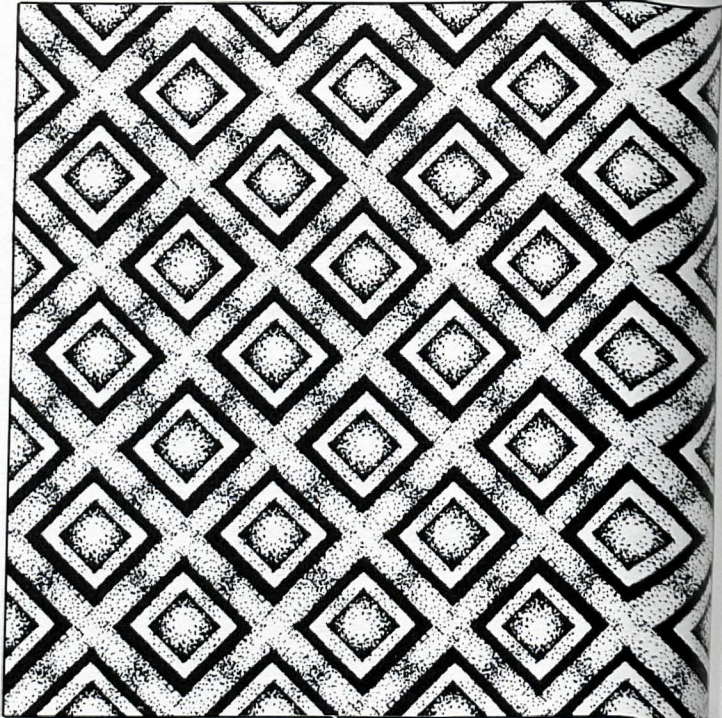
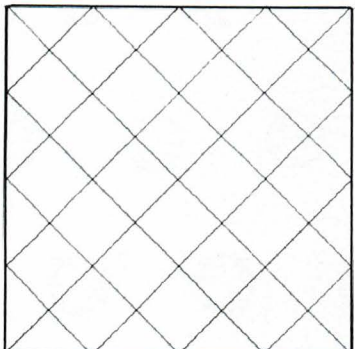


vertical proportion



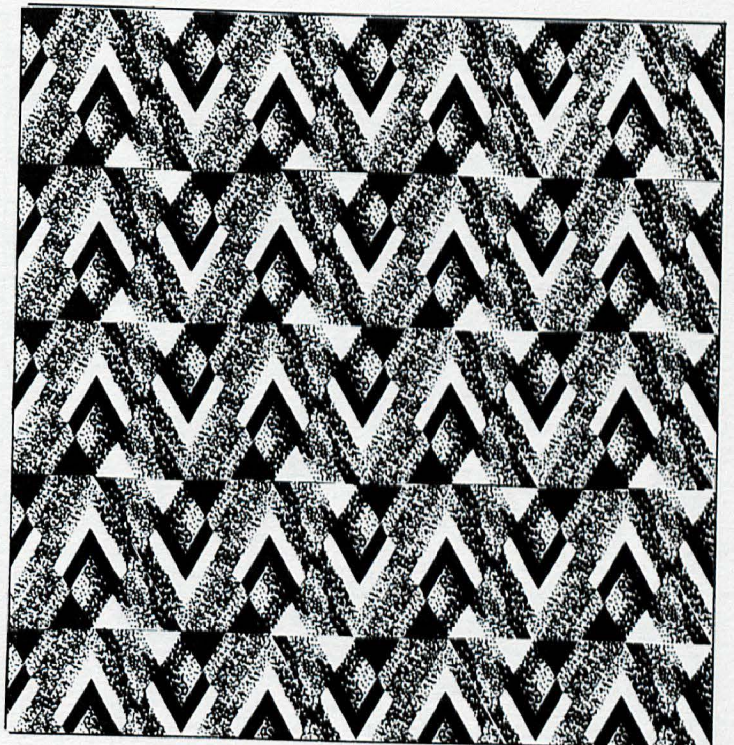
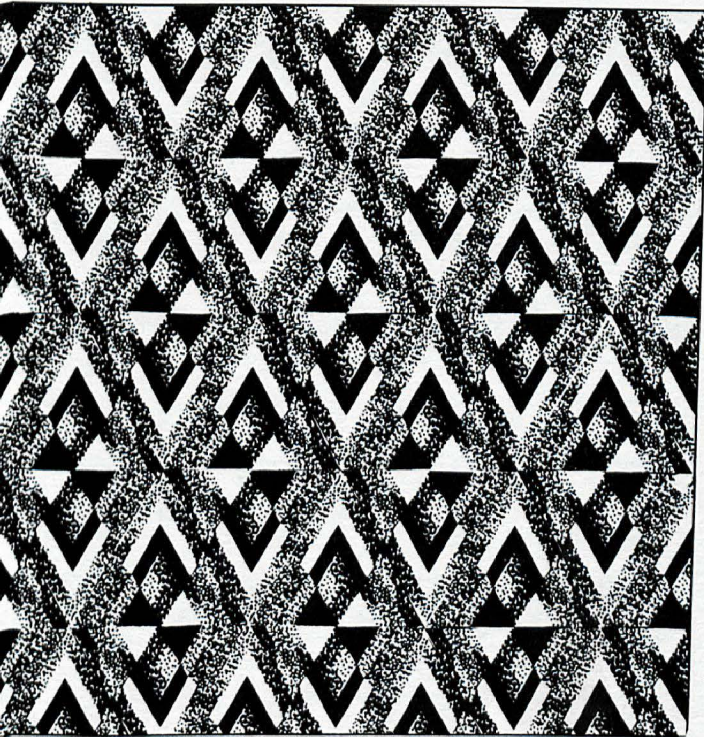
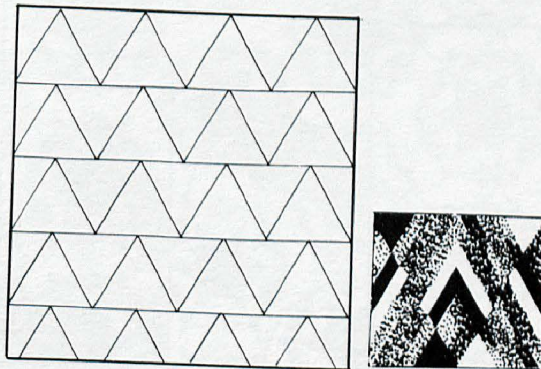
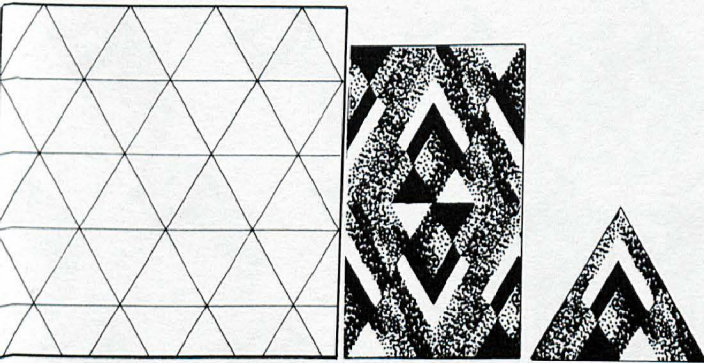
DIAMOND REPEAT

The block repeat, oriented at a 45 degree angle becomes the basis for the diamond repeat. The possible diagonal of the block repeat now becomes more readable as a horizontal line. The angles of the diamond may change, allowing the motif to elongate horizontally or vertically. The interlocking unit structure positions the motif alternately as in the half drop.



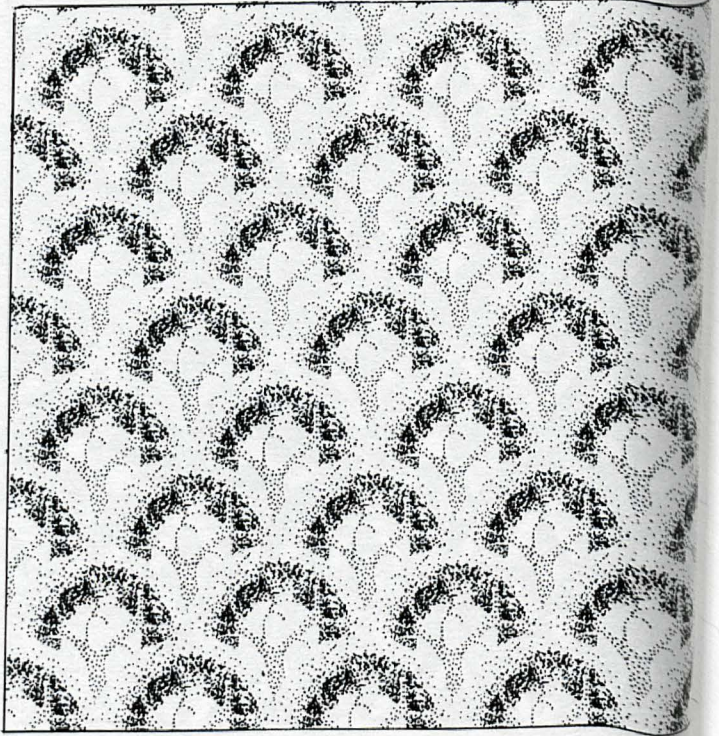
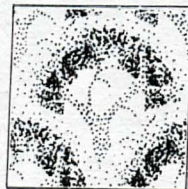
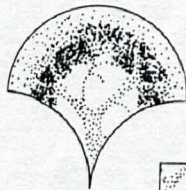
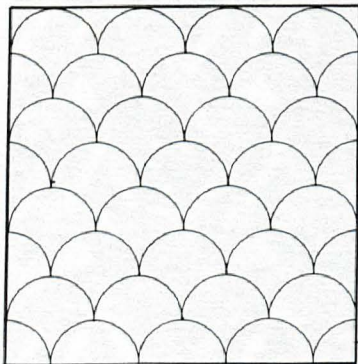
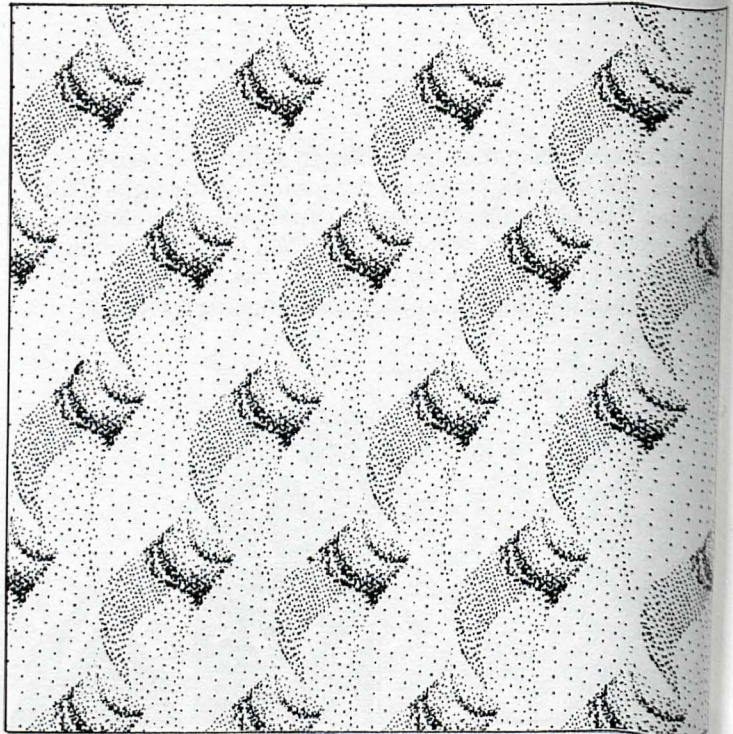
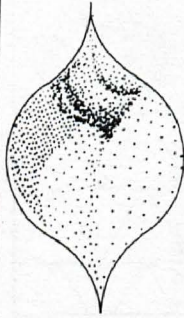
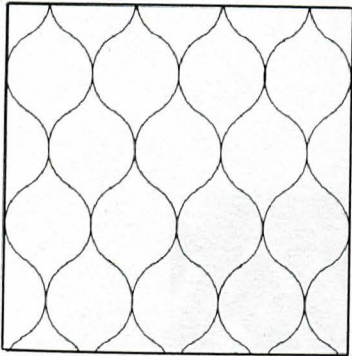
TRIANGLE REPEAT

A triangle repeat may be similar to a diamond repeat which has been split through the middle of the unit. This creates triangles with alternate orientations. Horizontal rows may be aligned as split units of the diamond creating a checked effect or may be shifted so that all triangles of one orientation fall into vertical lines making a zig-zag possible.



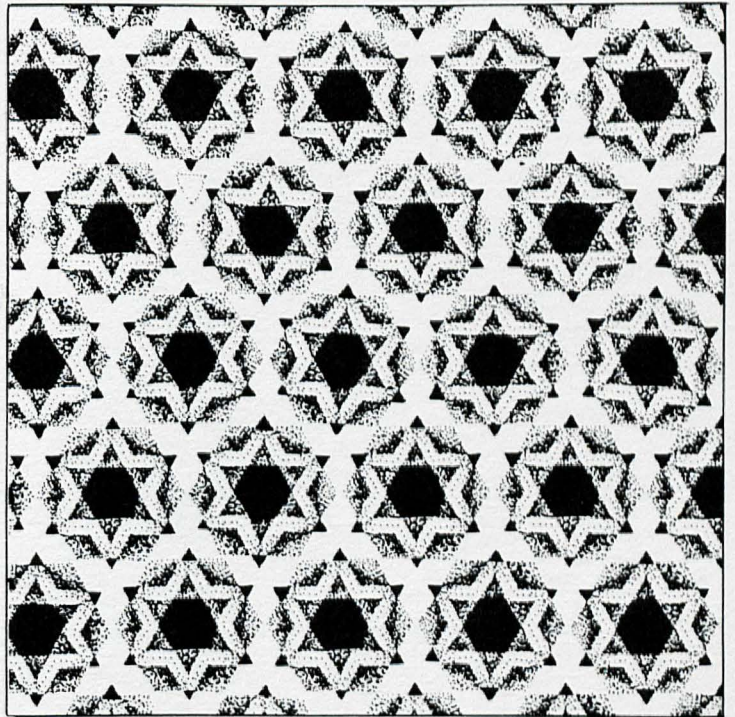
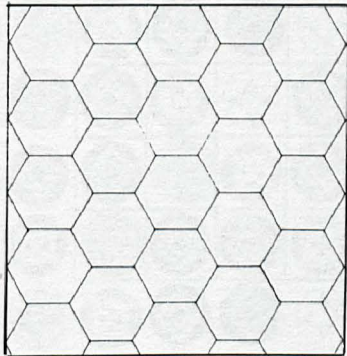
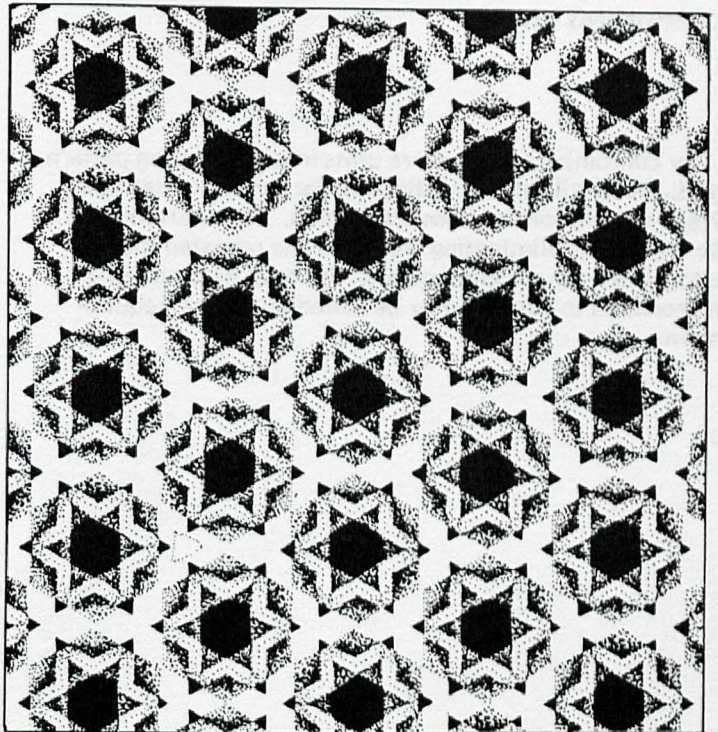
OGEE AND SHELL PATTERNS

The ogee repeat, having the same directional lines as the diamond repeat, is based on curves and circles. It allows for a natural fluidity in the visual pattern. The shell repeat, also based on circles, is more limited in the form of motifs which can be used. The unit shape is more objective and appears to overlap so that detail may alter the pattern appearance. Pattern line, when dealing with single units, may change less.



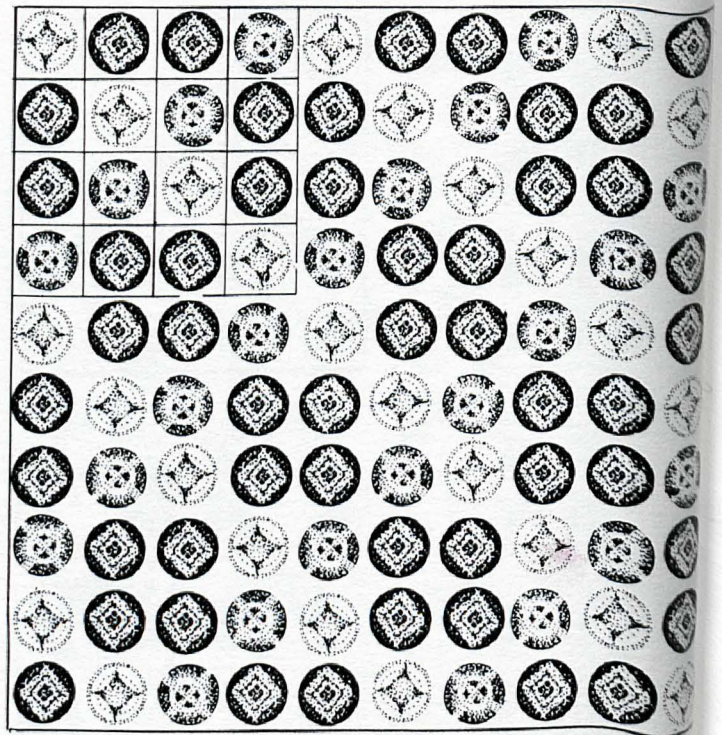
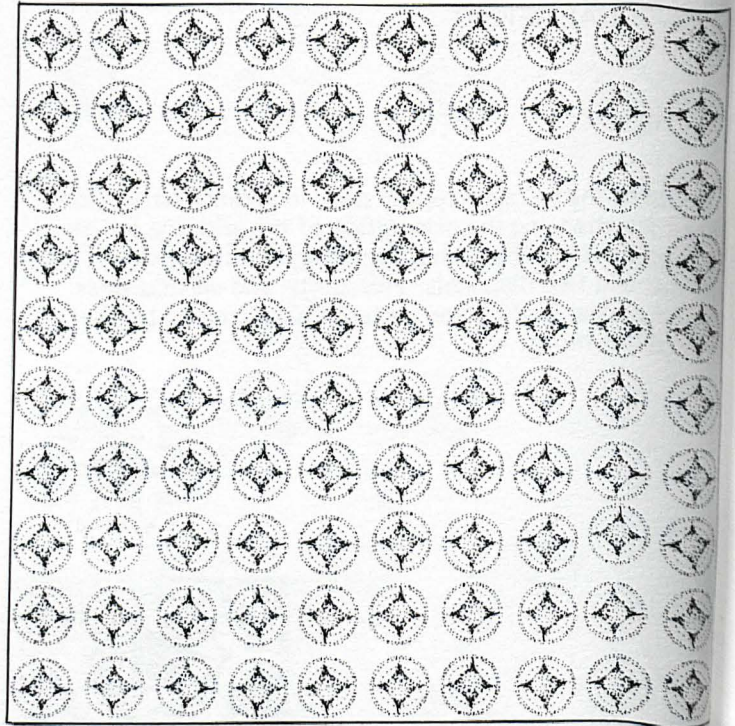
HEXAGONAL REPEAT

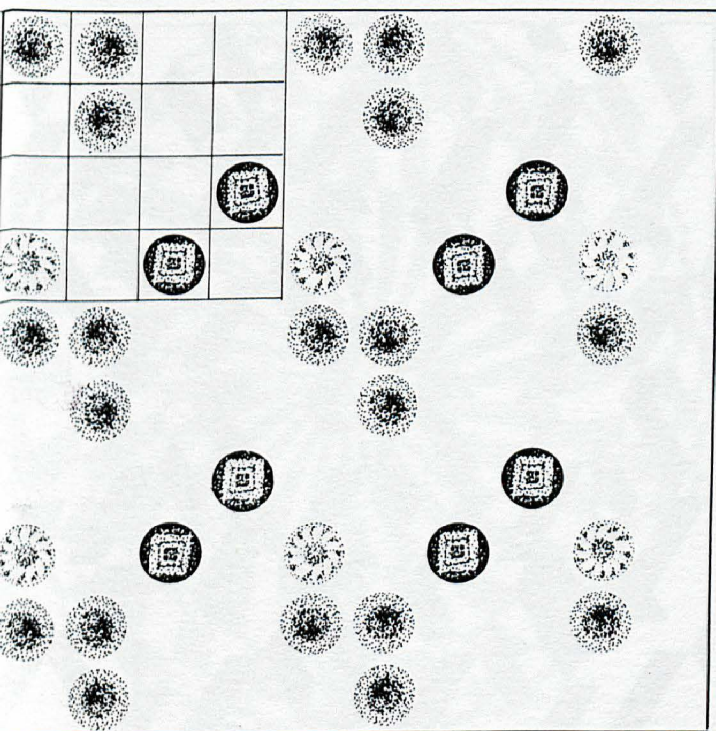
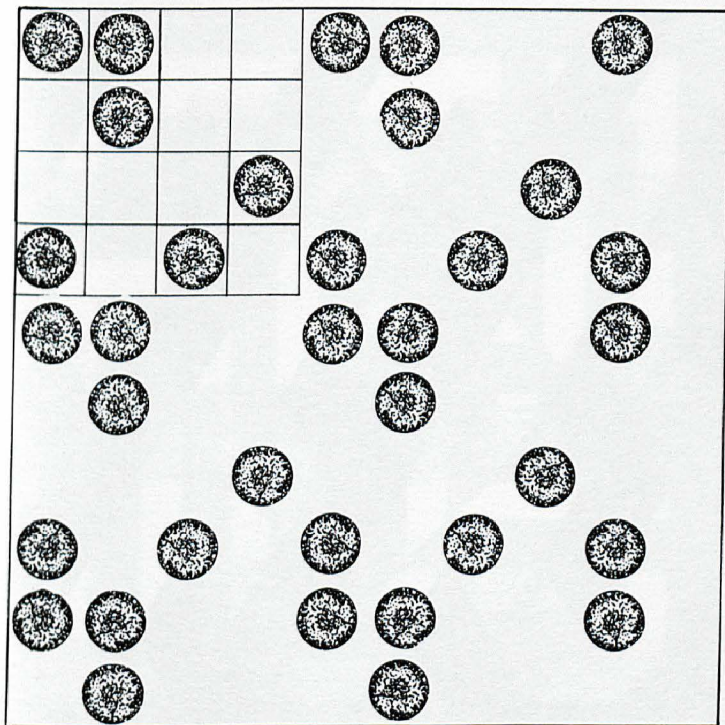
Units of the hexagon repeat stack in parallel interlocking lines. By changing the orientation of the grid, the inherent pattern lines may be; (1) horizontal and two diagonals, (2) vertical and two diagonals. Horizontal and vertical lines do not appear in the same pattern unless created by the lines of the motif.



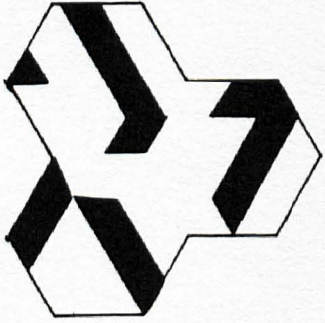
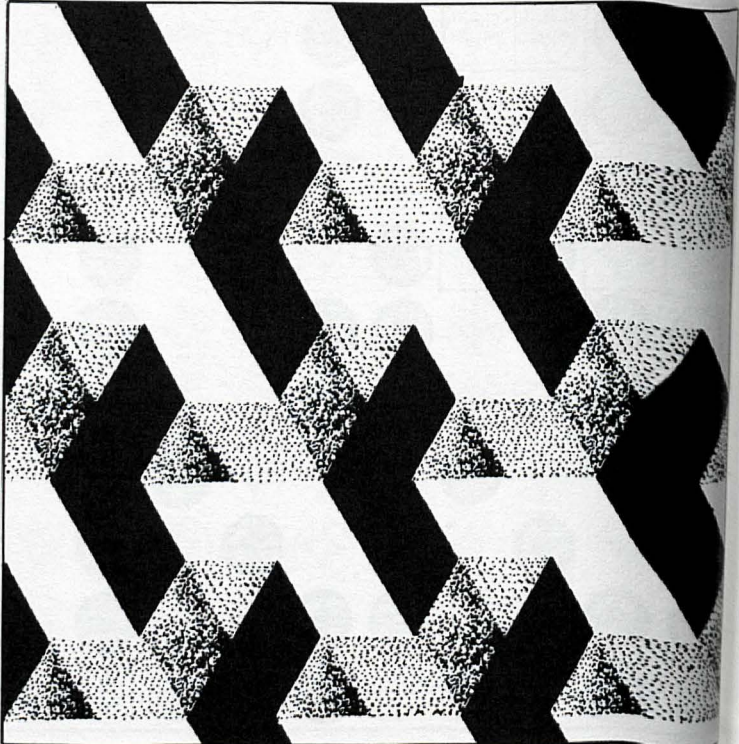
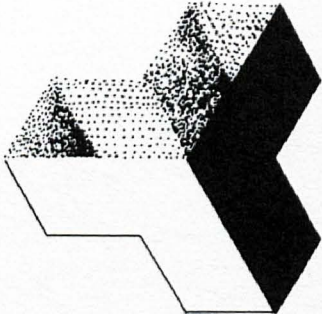
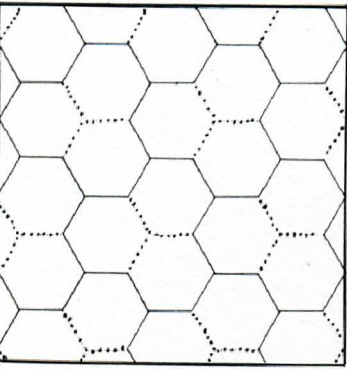
COMBINING UNITS

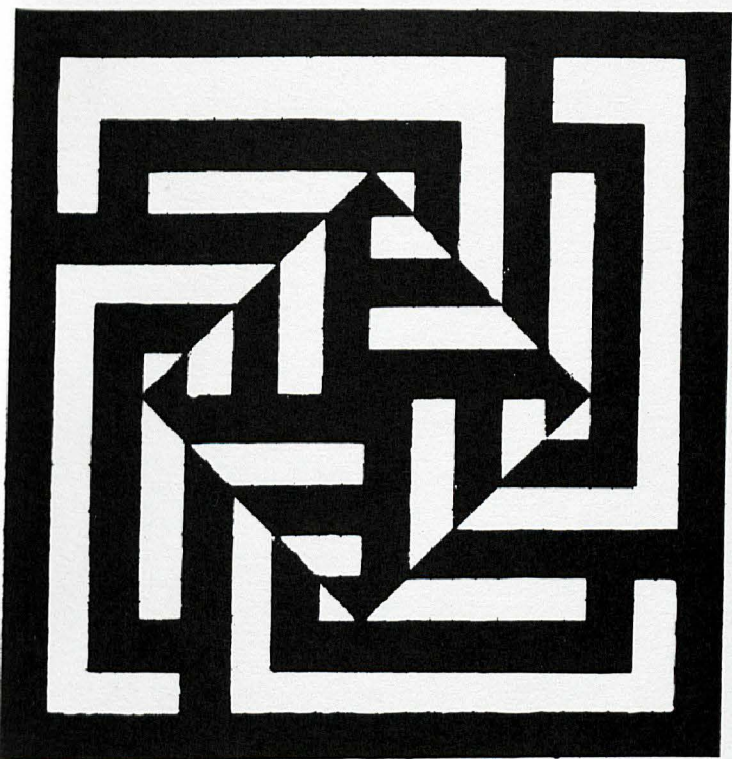
By combining two or more units into a repeating pattern grid, the details of the motifs may be varied so that new visual associations of lines are formed. Spot patterns can be created by eliminating groups of the repeated motif altogether. By combining units, the total pattern repeat is increased in size but may be sealed to fit size requirements.



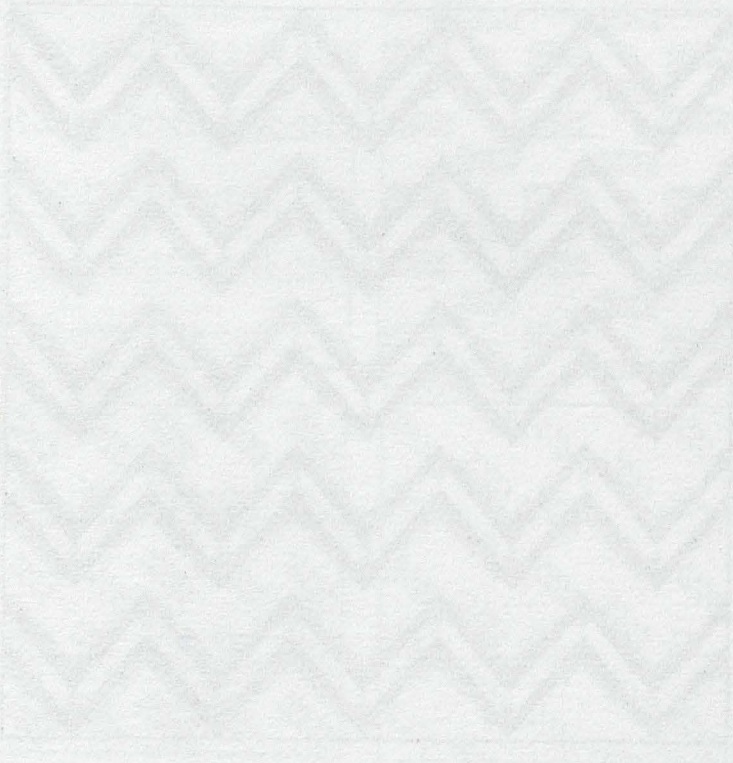
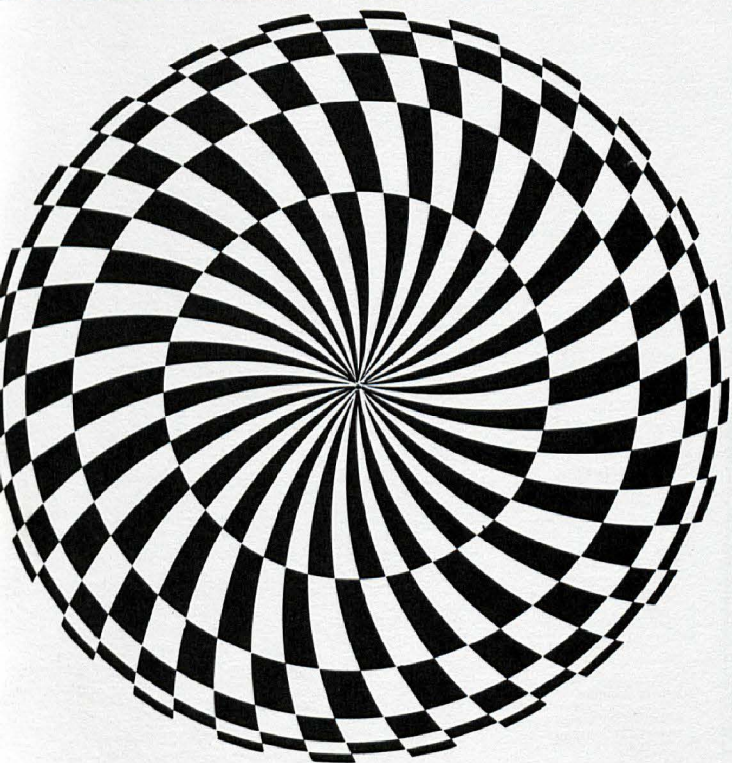


Units may be combined in a repeated order for the purpose of creating new visual forms. Rather than being confined to the lines of the original units and using a multiple number of similar motifs per pattern repeat a single motif or a group of less confined images may be developed with the new unit shape.

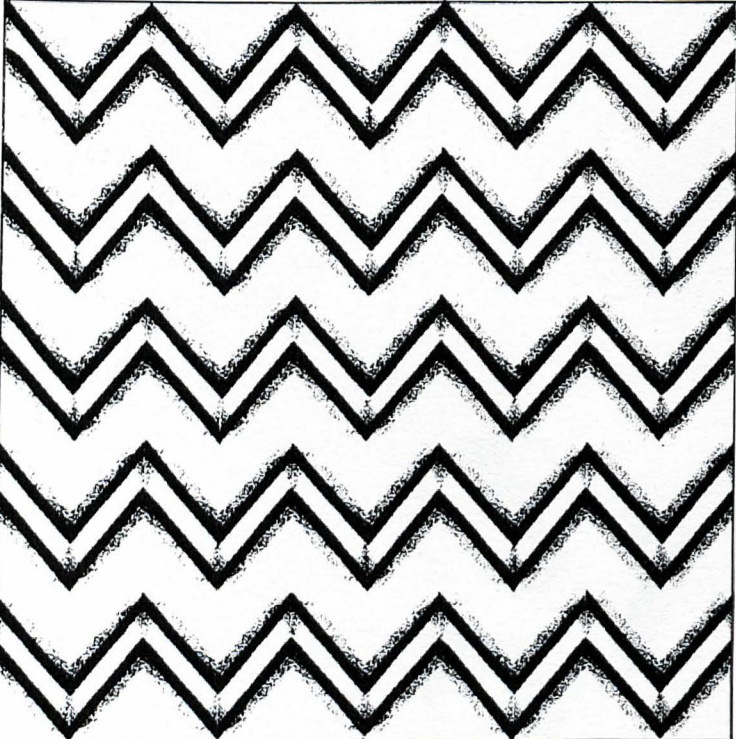




The eight pattern formats and variations may be used in the creation of pattern for continuous yardage applicable to a number of end uses. More specialized grids may be developed for specific products by dividing the total form into smaller units consistent with the lines of the form. Concentric development may involve increases or decreases in size and variation in shape of the unit. Where borders are created, corners may require new or adjusted motifs.

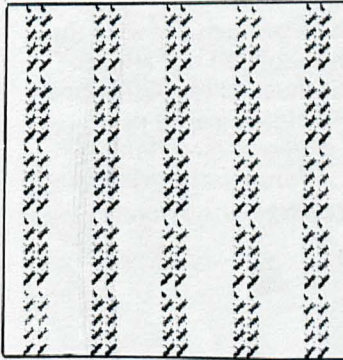


The inherent pattern lines have been considered for each type of organization. The repeated motif has had no strong directional quality or the direction has been evenly distributed so that no particular line is emphasized. If, however the motif does imply specific directions, the lines of the organization may be emphasized or concealed. In the block repeat, straight figures have been oriented three ways which form visual lines in three directions , emphasizing one of the possible lines of the organization and eliminating the others. The V motif, while indicating a downward motion as a singular motif, creates line in repeat which is different in character from the straight line but similar in linear direction. The horizontal chevron stripe is created by vertically oriented V's.

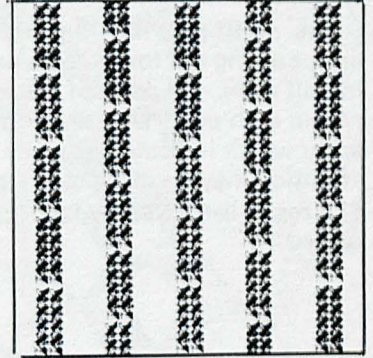


Where the alignment of units facilitates the alignment of motifs into single lines, those lines dominate. If the motifs do not form continued lines, they may become part of suggested lines created by the repeat structure. Rather than straight broken lines, vertical lines composed of a number of short lines can be seen when one straight figure is placed in a drop repeat. If continuous lines are desired, additional motifs can be added to fill in spaces broken by the drop.

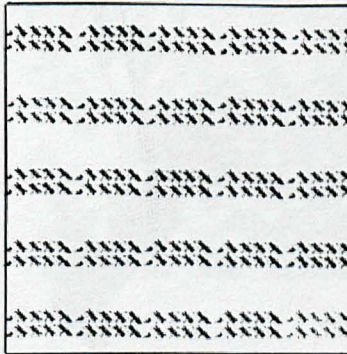
block repeat vertical



half drop



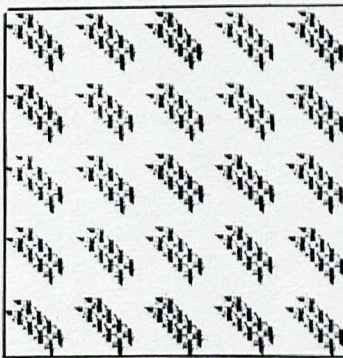
block repeat horizontal



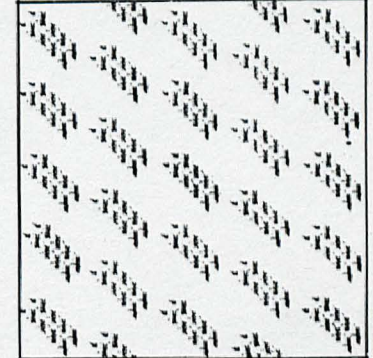
half drop



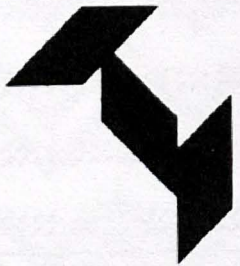
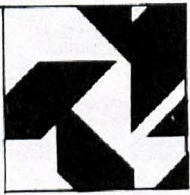
block repeat horizontal



half drop diagonal



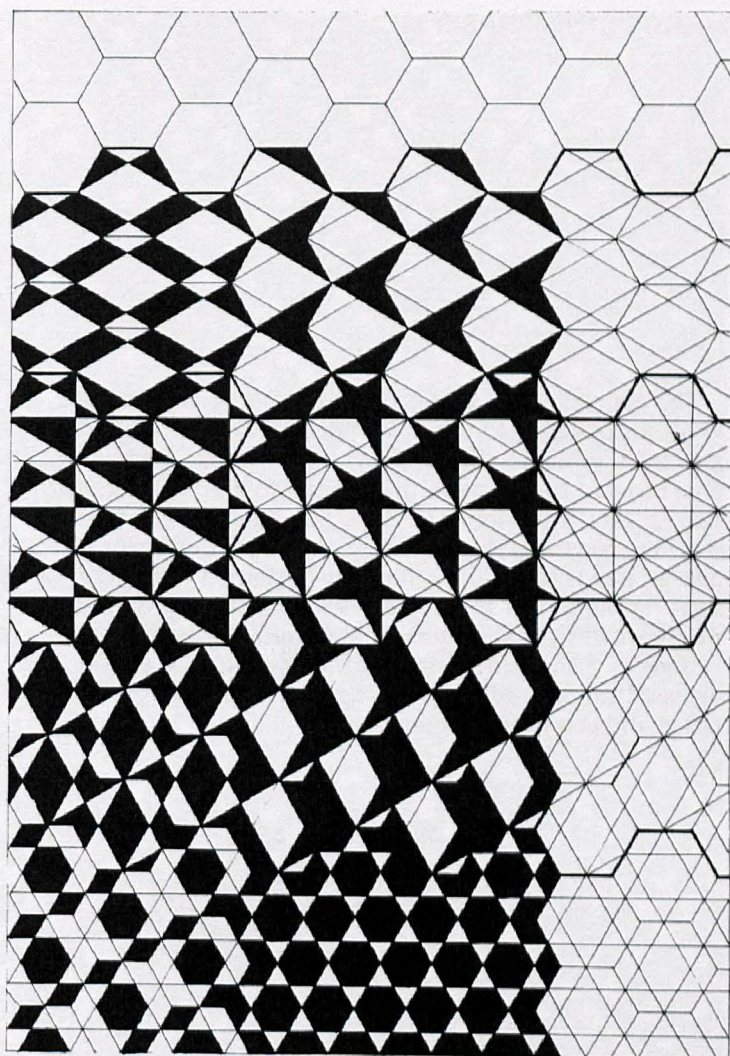
The motif may have dimensions larger than those of the unit, causing the forms to be neither isolated nor aligned in unit rows. All parts of the motif must still be contained within each unit. By using forms in closer spacial proximity which indicate a number of different directions, attention may be distracted from all organizational lines. The result is a pattern which appears free or randomly spaced.



ORGANIZATIONAL GRIDS

Organizational grids may be subdivided into smaller units for motif development. Differing from the incorporation of several shapes to create new unit formations and grid patterns, multi-unit repeats do not increase in size. They also have a set number of divisions within the unit from which the motif can be developed. Textile design graphs are an example of rectangular pattern areas divided into small squares representing knit loops or surface weaving yarns. The smaller subdivisions are selected and grouped to form color or textural patterns.

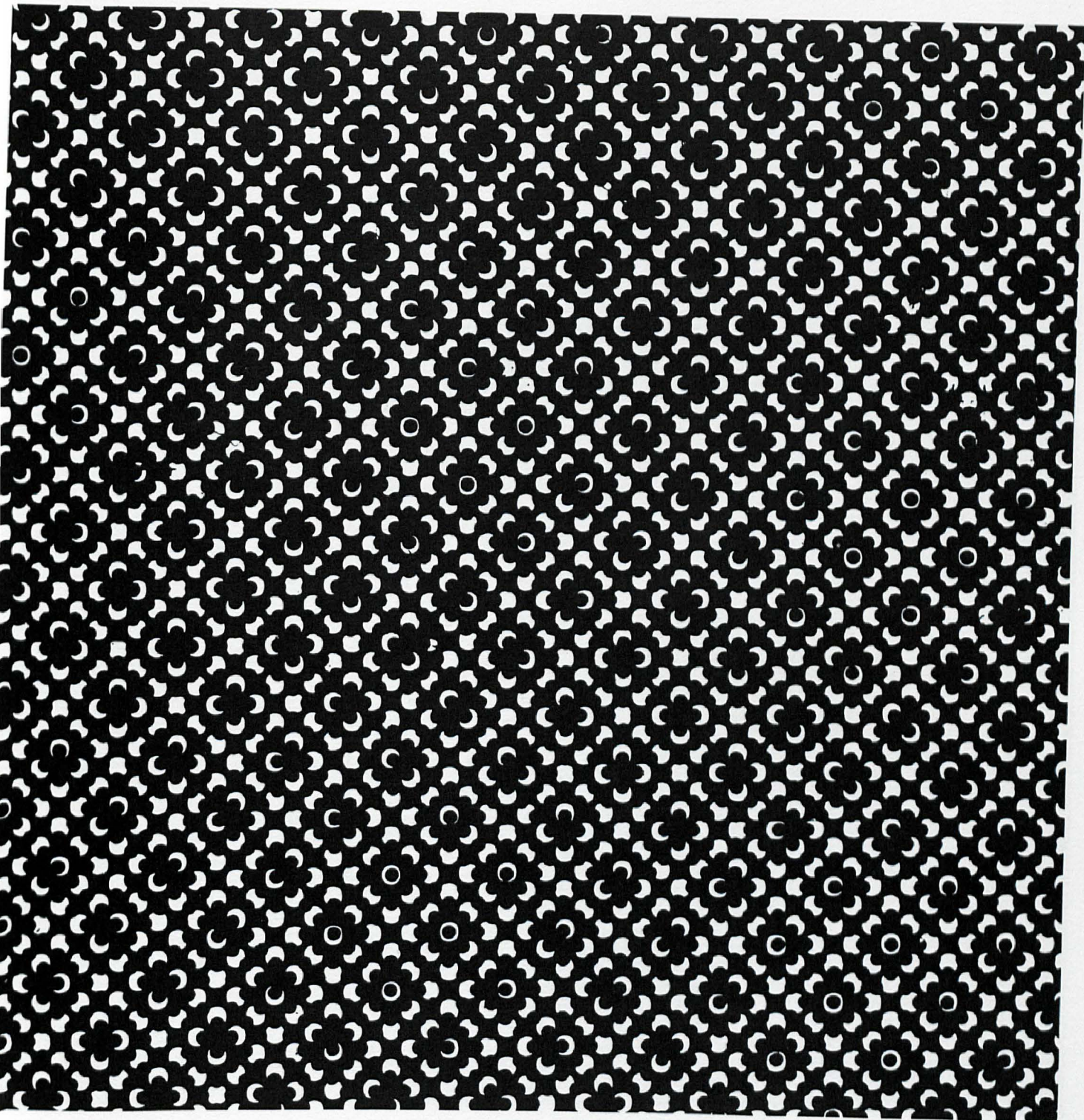
Without application to a specific method of construction which requires production on a horizontal or vertical axis, units may be divided into unlimited shapes. These units can be selected to form the motif, creating a variety of pattern lines.

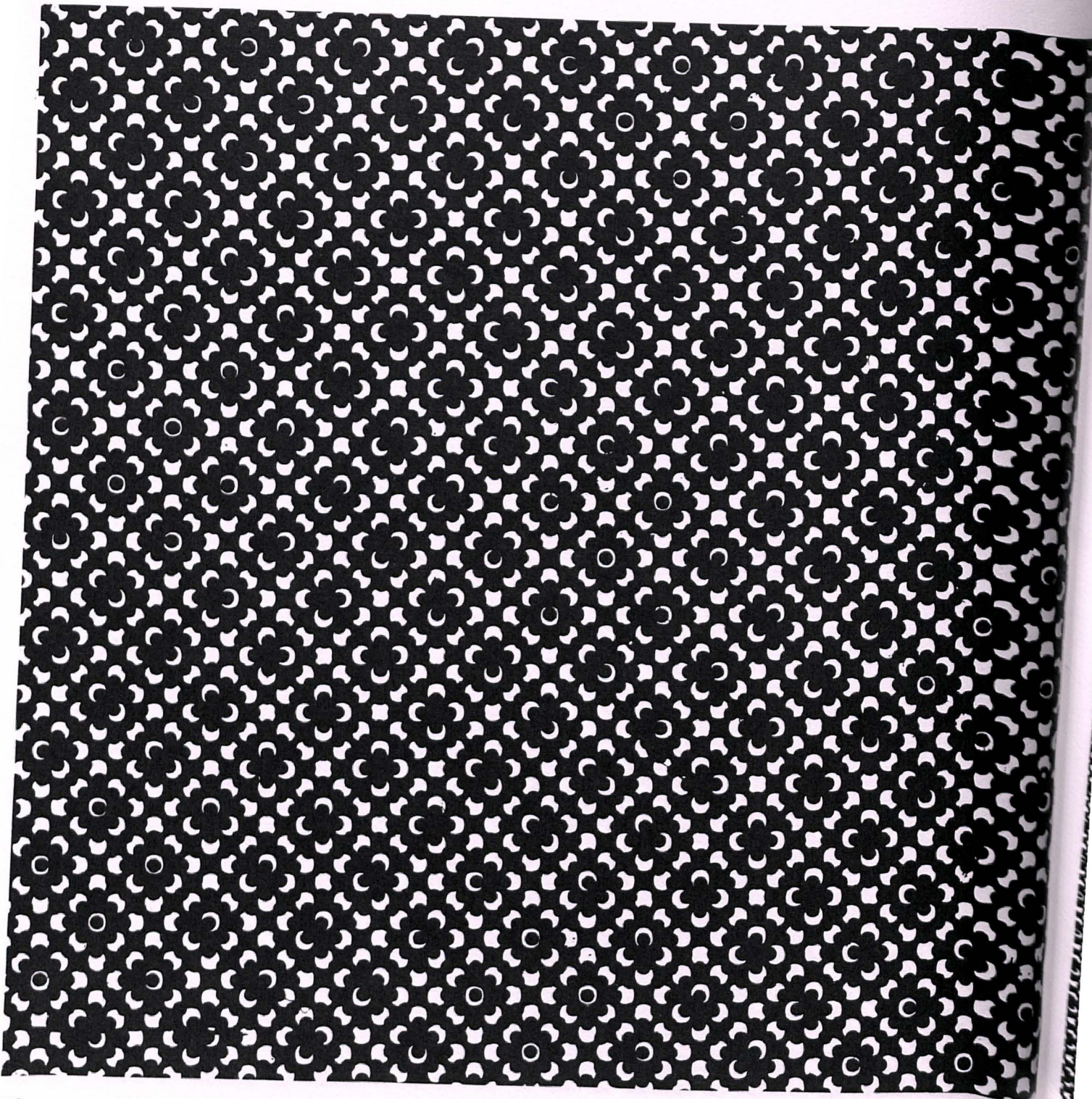


CHANGE OF EMPHASIS

The appearance of pattern line is not only affected by relationships of the internal components of pattern but also by external relationships with the viewer. When the area covered by the pattern is limited to a smaller size with few repeats, attention is given to the detail or motif rather than the general lines. Lines become more dominant when a large area is covered by the same pattern. Changes of scale have a similar effect. General pattern lines dominate a very small figured pattern or a pattern viewed from a distance. If the same pattern is increased in size or if it is viewed from a close range more attention is given to the detail and less to the generalities.







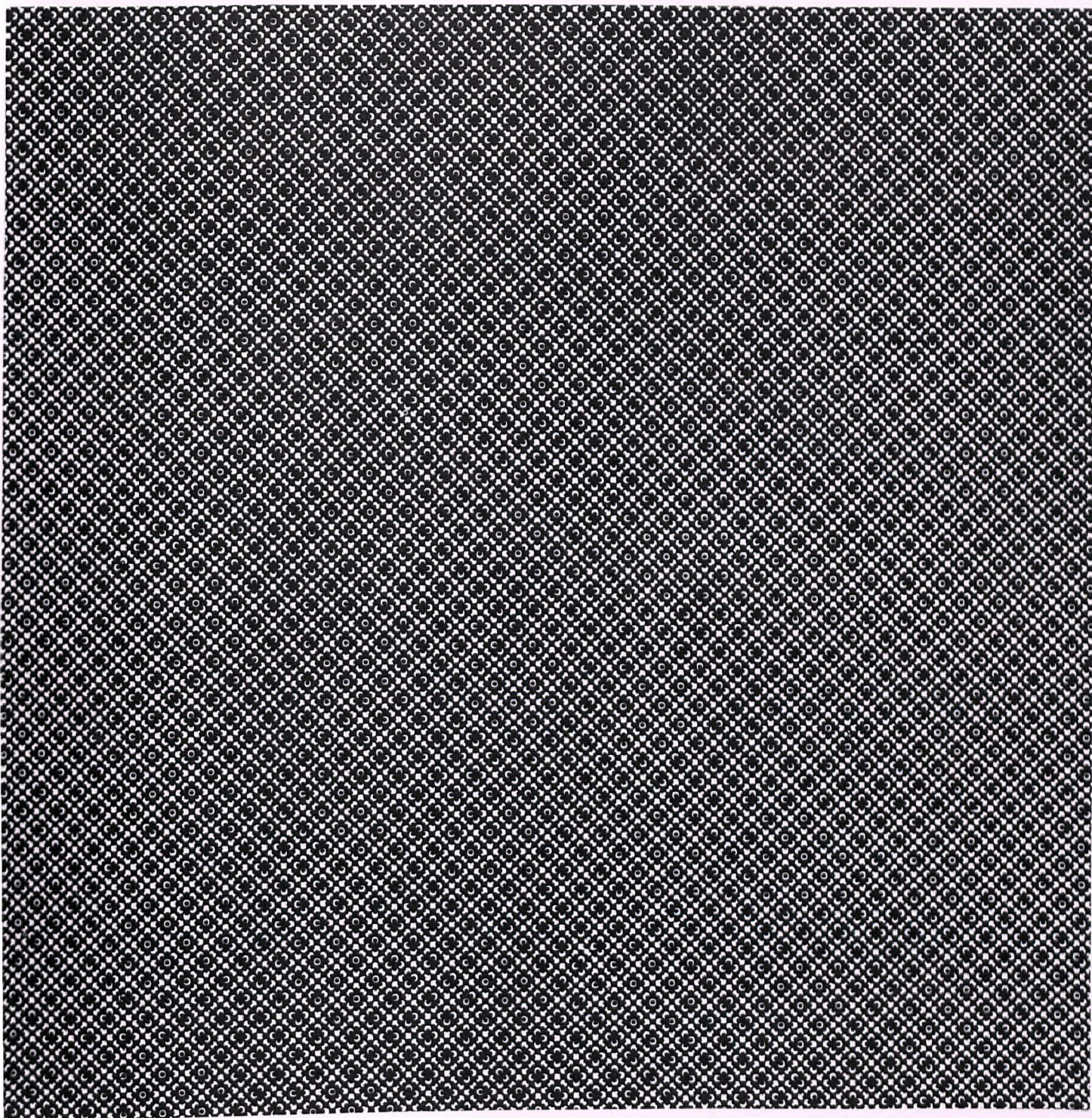
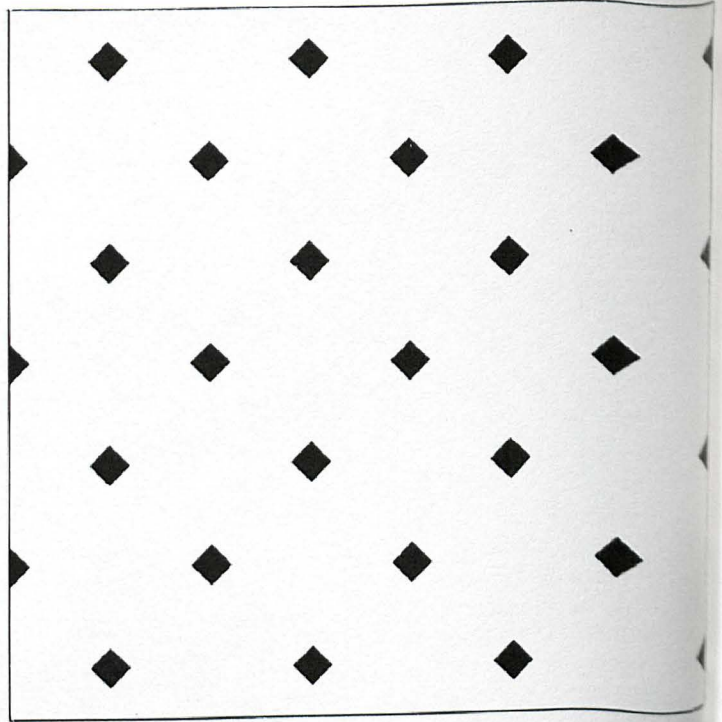


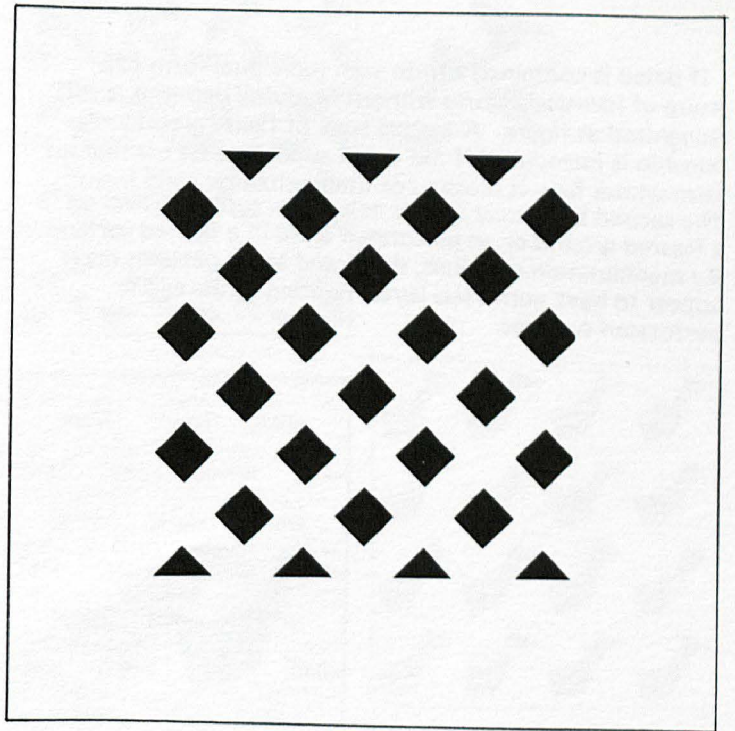
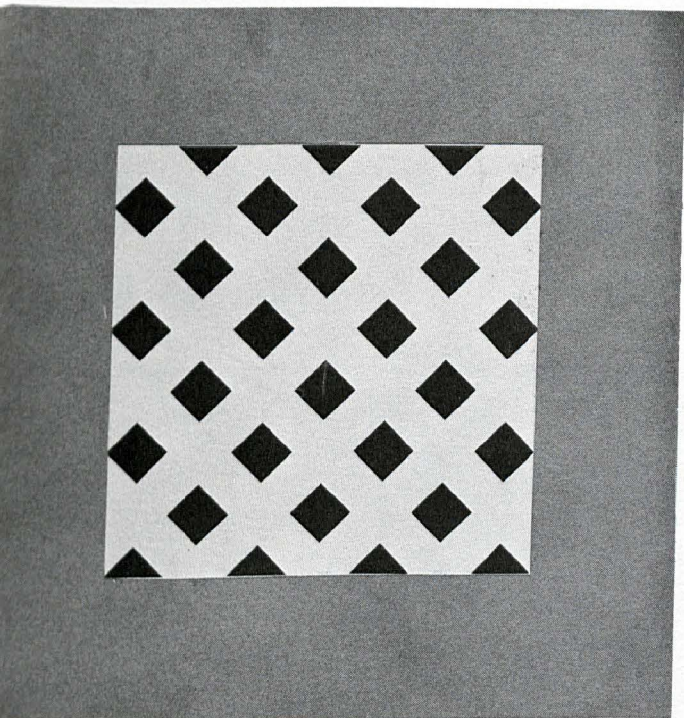
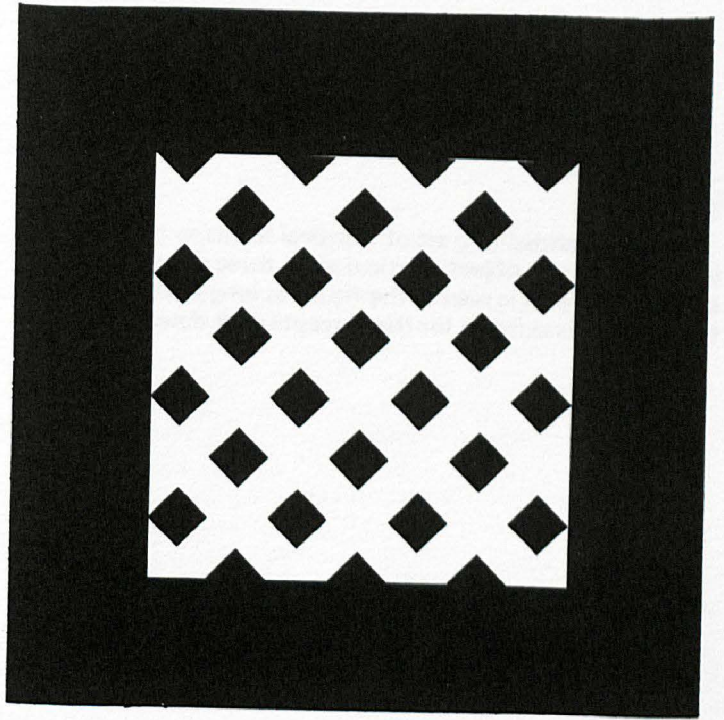
FIGURE GROUND RELATIONSHIPS

Attention is most immediately given to the motif and to the lines they create rather than to those of the space in which the motif is seen. Since we visualize an object as existing within the framework of a larger space, in pattern we tend to understand the smaller forms as object or figure and the larger surrounding space as ground. By changing recognition of figure and ground, the visual line of the pattern may be changed. Rather than creating defined lines, the diamonds in the first pattern are spaced far enough apart to create a spot effect. If the size or number of diamonds is increased. The surrounding area is decreased. The figure and pattern lines are no longer isolated diamonds but continuous diagonal lines.

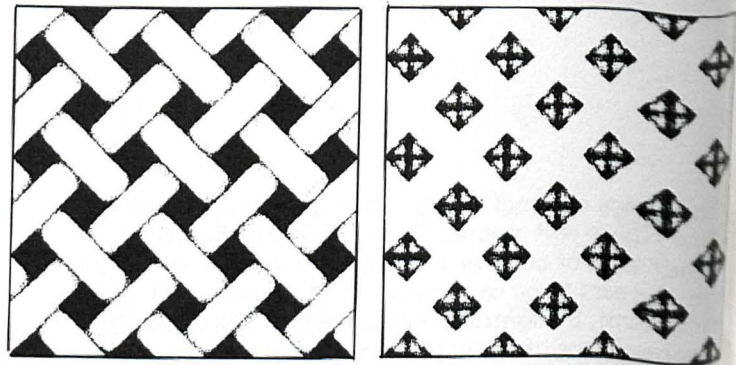
The degree of value contrast may link two or more forms together as one surface or separate them altogether. Shapes of lowest contrast tend to associate as one form having surface design since the appearance of depth is minimized. Higher contrast maximizes depth and separates form.



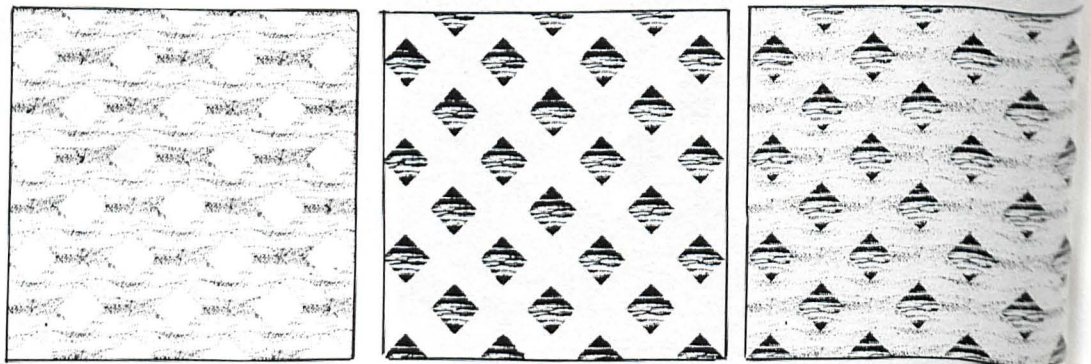
The space external to the patterned area may further define figure and ground. If an area is surrounded by another area of color or texture of an internal form, that form appears to be continued as ground space. The opposite form, by contrast, appears as the figure and again the appearance of the pattern line may be manipulated.



If detail is added to a set of identical forms so that it is understood as an object, particularly a three dimensional object, that form is seen as the figure as long as the scale of the patterns is suitable for the perception of detail.

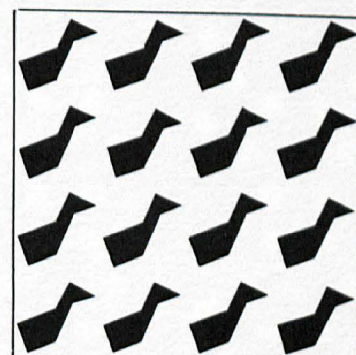
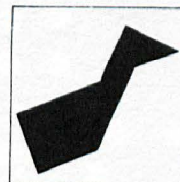
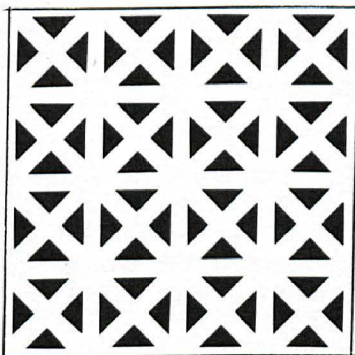
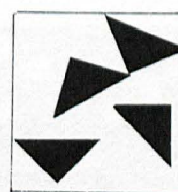
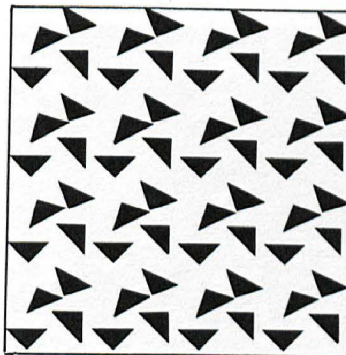
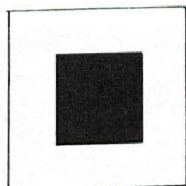
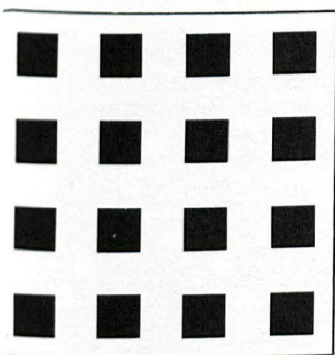


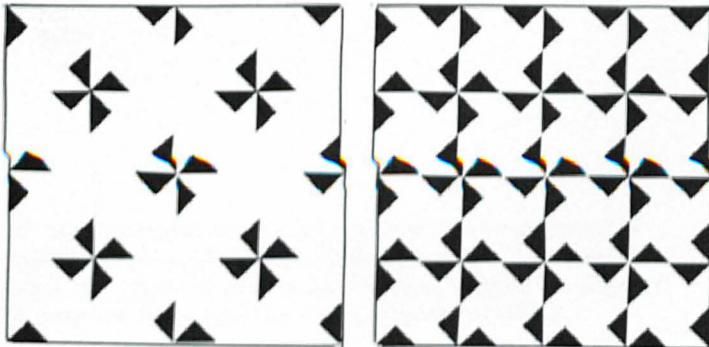
If detail is contained within each individual form of a group of identical figures without implying depth, it is still recognized as figure. A second level of figure ground relationship is introduced if the detail appears to be continuous form whose flow is blocked or interrupted by solid forms. The second form may appear as a figure superimposed on a figured ground or as perforated areas in a figured surface. By manipulation of values, detail and scale; patterns may appear to have numerous layer, floating forms and perforated surfaces.



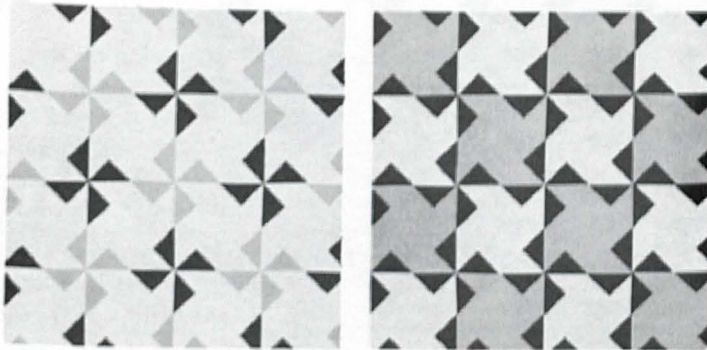
Regularity of form and internal continuity of space contributes to the definition of figure and ground. A pattern may be ambiguous when the forms of the internal spaces are highly regular and similar in area.

This is particularly true when geometric and symmetrical shapes are used. The pattern here may be interpreted as black squares on a white ground or white lines on a black ground. If the square is divided and moved apart at regular intervals, the regularity of both white and black forms continue to create possible reversal situations, even if smaller forms are created. Smaller shapes, when rearranged into a random order appear as a number of identical objects with different orientations. The regularity of form in the once linear space has been destroyed but the continuity of tone or texture defines it as ground. If the smaller shapes are further regrouped back into a compact but asymmetrical form, the spacial isolation defines it as figure.





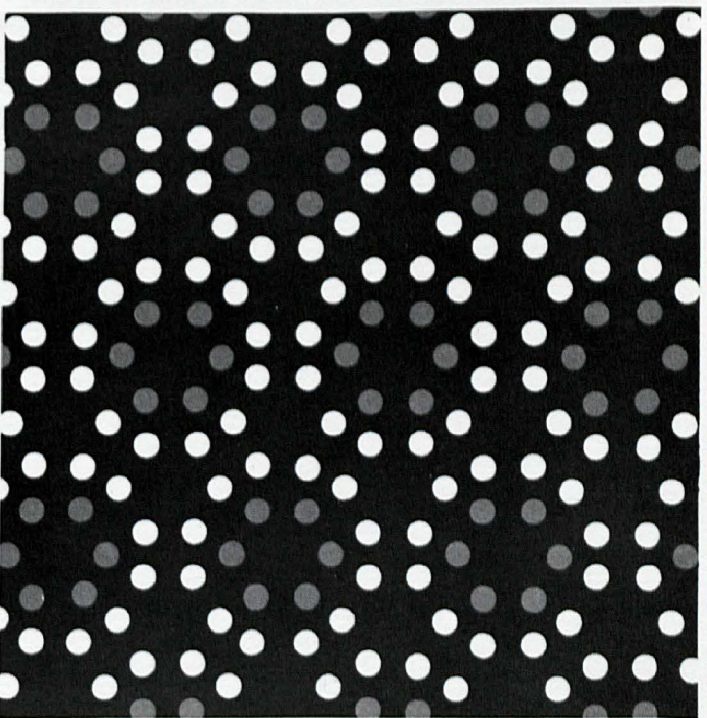
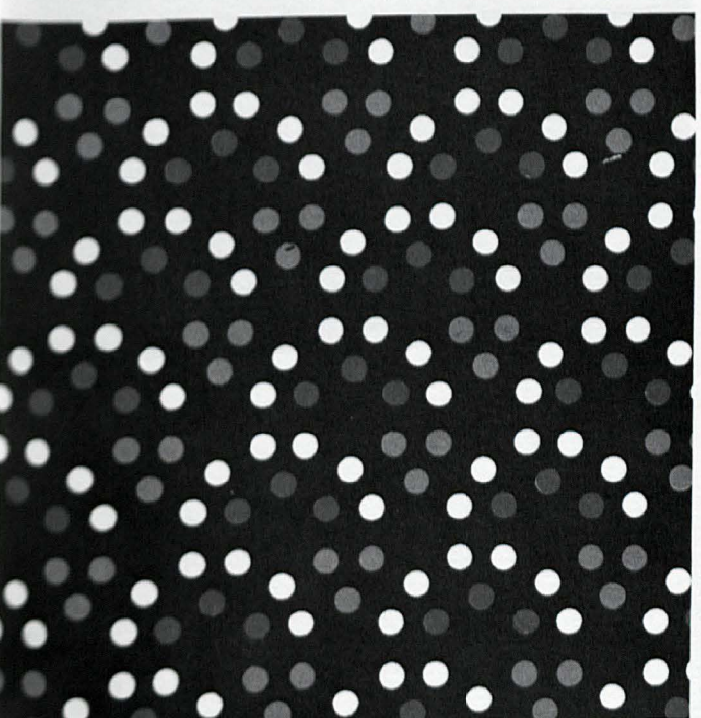
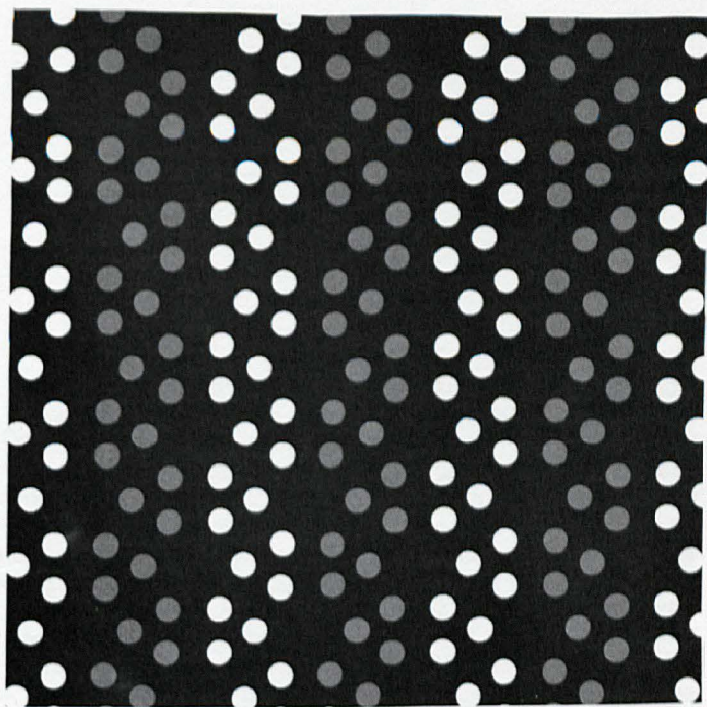
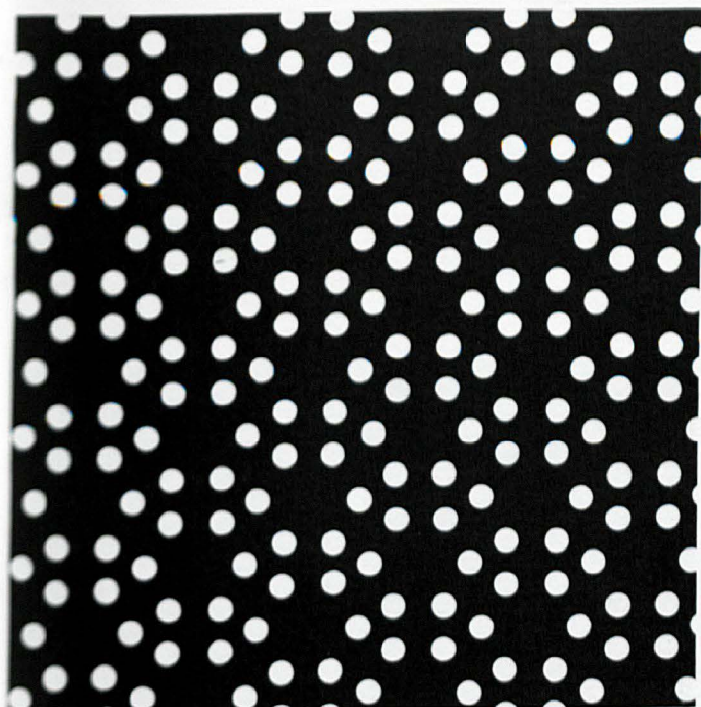
Changing value of identical shapes defines the figure, where as contrast destroys the idea of continuous ground space. If more of the identical figures are added, the ground space becomes further isolated and divided from the pattern area. An ambiguous situation results. By changing the surrounding area, either set of forms may be seen as the figure.



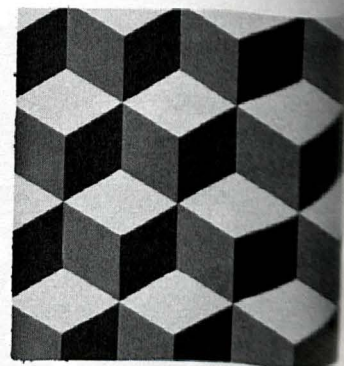
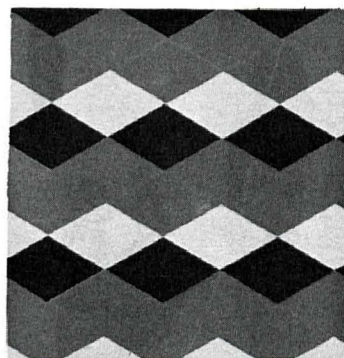
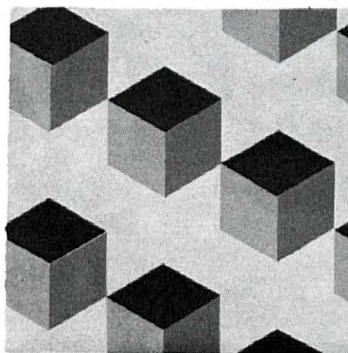
By contrasting values of identical forms within the pattern, continuous ground space is no longer possible in the area. It is the lack of contrast in the remaining forms which creates ground space.

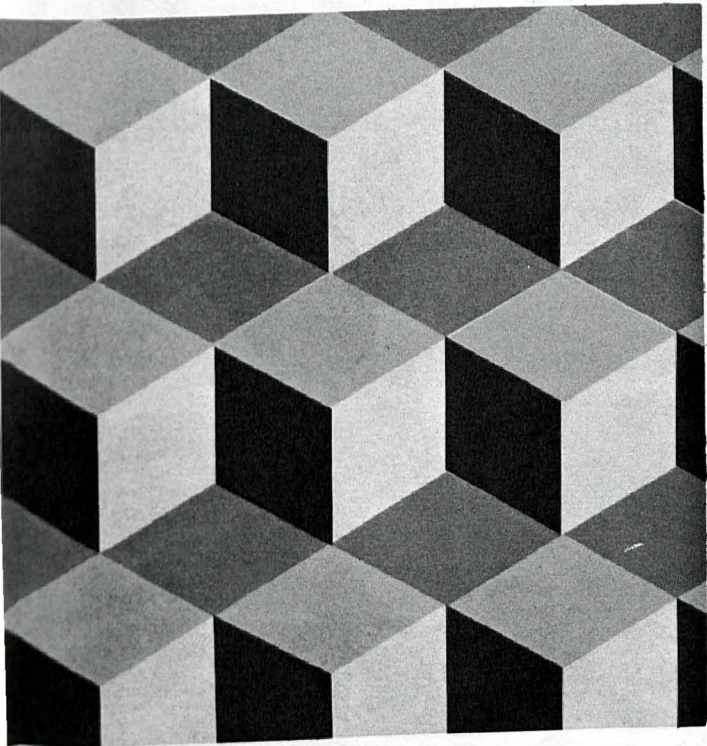
VALUE AND CONTRAST

Value associations and contrasts are a means of creating new forms from spacially isolated areas. In the following pattern, small white dots are aligned to form a circular motif. By changing values of selected groups of dots, new form and line are created. Figure ground reversals may occur if a window effect is seen. The continuous form of the black ground may appear as a perforated surface which partially blocks of the form behind it.



Contrasting value, then, serves to separate or isolate form whereas lack of contrast unifies and connects form. In a pattern format where all forms are identical in size and shape, changing values of selected groups of figures creates new shapes. Units of one value associated as one shape separated by contrast from the form created by a second set of associated units. As new associations are formed, new shapes within the format occur as in a multi-unit type of pattern organization. When more than two values are introduced into this format, two or more spacially connected forms may be associated as sides of a three-dimensional surface without superimposed or perforated figures. The boxes created by three values may appear to change orientation. Shapes identified at one time as a side, top, or bottom may also appear as another side, or bottom, or top at another glance. Regardless of this change the pattern is still a continuous three-dimensional surface.






The degree of value contrast may link two or more forms together as one surface or separate them altogether. Shapes of lowest contrast tend to associate as one form having surface design since the appearance of depth is minimized. Higher contrast maximizes depth and separates form.

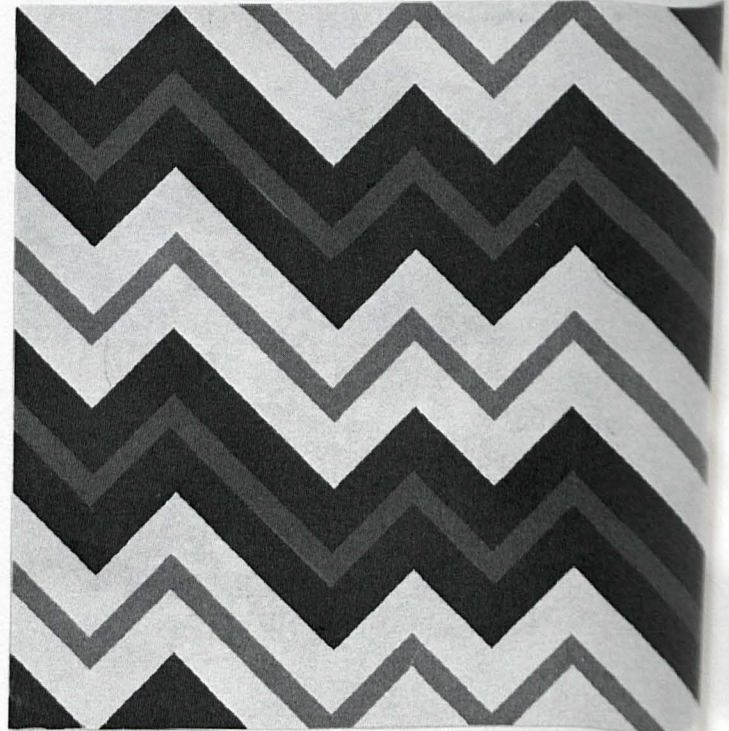
If a fourth value is introduced, the orientation of the figures continues to change but a number of reversal situations are created. Three values are associated as parts of a box, leaving a fourth value as space behind the objects or ground.

LIGHT AND DARK VALUES



The appearance of lightness and darkness of a particular gray value is relative to the lightness or darkness of the surrounding spaces. Gray, when surrounded by black appears lighter than the same gray surrounded by white. A pattern, then, may be designed so that visually, it has more changes of values than exist in pigment. The reverse situation is also implied. If a number of forms are to appear constant in value when surrounded by a number of different values, adjustments may be necessary. A greater number of pigment values would be required than exist visually.

The degree of visual change caused by this simultaneous contrast is influenced by the proportions of the respective pattern forms. If the gray which is enclosed by a number of forms changing in value is a smaller area than the surrounding forms, the appearance of visual contrast is emphasized. Contrast is minimized when the area of the enclosed gray is larger in proportion than its surrounding forms.



COLOR

The use of color in pattern development provides a greater range of design possibilities. Whereas an achromatic value range is based on light-dark relationships of form, color relationships are based on contrasts of hue, value, and intensity.

These somewhat isolated means of contrasts are available with the use of color although it is through the manipulation of these color properties in combination, rather than isolation, that the use of color reaches its greatest potential. Any pure hue may be extended with a set of lighter or darker chromatic values which match a set of achromatic colors. Contrast of hue is then eliminated and pattern effects may be created with tints and shades of a hue similar to those of a gray pattern. The strongest or most intense colors in an achromatic scale lie at the light and dark extremes--black and white. Each pure hue in the color spectrum has its own light value, yellow being the lightest and violet being the darkest. The most brilliant state of a hue falls between the extremes of tints and shades. An achromatic pattern translated into a monochromatic pattern may differ in dominance of form since the highest brilliance of hue occurs at different intervals on the value scale.

Two hues then of equal value contrast to a common ground may not be equal in visual strength. On a neutral ground the color of highest saturation becomes dominant. A conflict for dominance occurs when one figure is of low saturation and high value contrast with the ground and another is of high saturation and is of low value contrast.

When repeating motifs are of unequal area, the form in highest color contrast with the remaining pattern forms is seen as the dominant figure and creates pattern line. It is this high contrast figure that remains visible as line or form at greater distances. Two figures in low contrast are less noticeable as separate forms when the third figure in very high contrast distracts attention from the two. If the third figure is in lower contrast, the remaining two forms are more visible as separate shapes.

Ambiguous figure ground relationships of colored forms respond to changes in color surroundings in the same way as achromatic patterns. If a color contained within a pattern is repeated so that it surrounds the pattern area, that color is associated as ground within the pattern. Attention is directed to figure forms. If, however, the pattern is composed of motifs of different hues within large areas of black and white, a color border accentuates the motif.

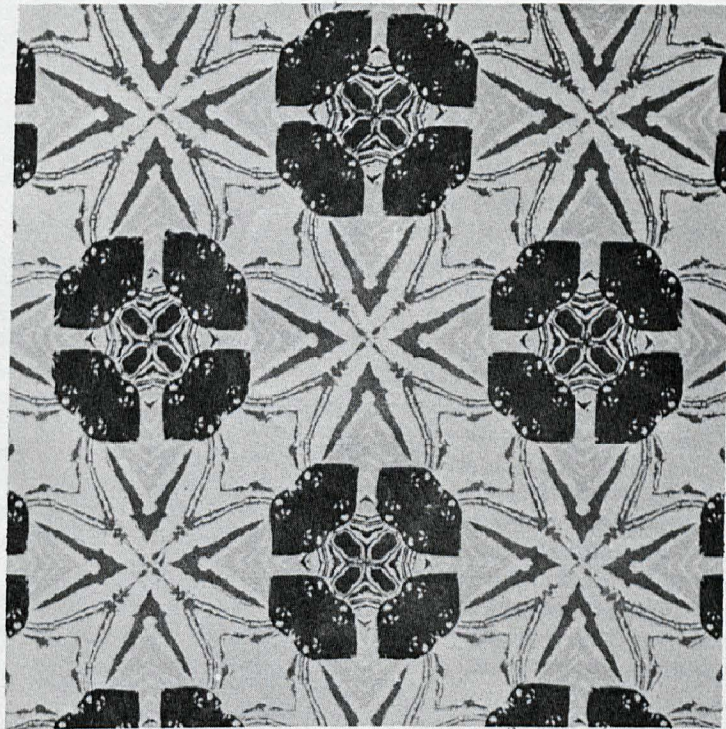
Individual color differences are more recognizable in pattern forms on a large scale. If scale is decreased, colors with similar characteristics lose much of their individuality and become visually associated as one general form. As with scale changes in black and white, details are seen on a larger scale and generalities on a smaller one.

Color pattern on a very small scale or seen from a greater distance may result in the visual mixture of color. Colors of individual forms fuse and are perceived as solid color areas. If the amounts of colors and their spacial relationships remain both constant and evenly distributed, surface on a minute scale will not display its general lines created by the organization.

Color pattern on a very small scale or seen from a greater distance may result in the visual mixture of color. Colors of individual forms fuse and are perceived as solid color areas. If the amounts of colors and their spacial relationships remain both constant and evenly distributed, surface on a minute scale will not display its general lines created by the organization of motifs. If color distribution varies from one area to another lines remain visible. Color as a result of a visual mixture of two or more hues is more vibrant than a color mixture of pigment in the same proportion.

The visual characteristics of color, like value, are relative to the color characteristics of the surrounding space. A hue appears lighter on a darker ground and darker on a lighter ground. It is most brilliant when surrounded by its compliment and weakest when surrounded by a more intense color of a closely related hue. A hue may appear warmer on a cool ground and cooler on a warm ground. The hue itself may appear to change, its uniqueness emphasized by its compliment but when surrounded by any other hue, exhibits qualities of the surrounding hues compliment.

Let's use blue as an example of color change. When given an orange background, blue appears purest. When placed on green it appears reddish and on red appears green. Colors created by a mixture of hues exhibit the characteristics of one of its components best when surrounded by the other component color. Blue-green is 'greener' on blue and bluer on green. This interaction of color creates further possibilities and problems with pattern development. A minimum number of pigments may be used to create a greater number of visual colors and with easily made ground color changes, dominance of forms and line are altered. If patterns are to be translated into new color schemes without changing form and line, adjustments in hue must be made for each color set.



A SIMPLE COMPUTER-AIDED PATTERN DESIGN SYSTEM

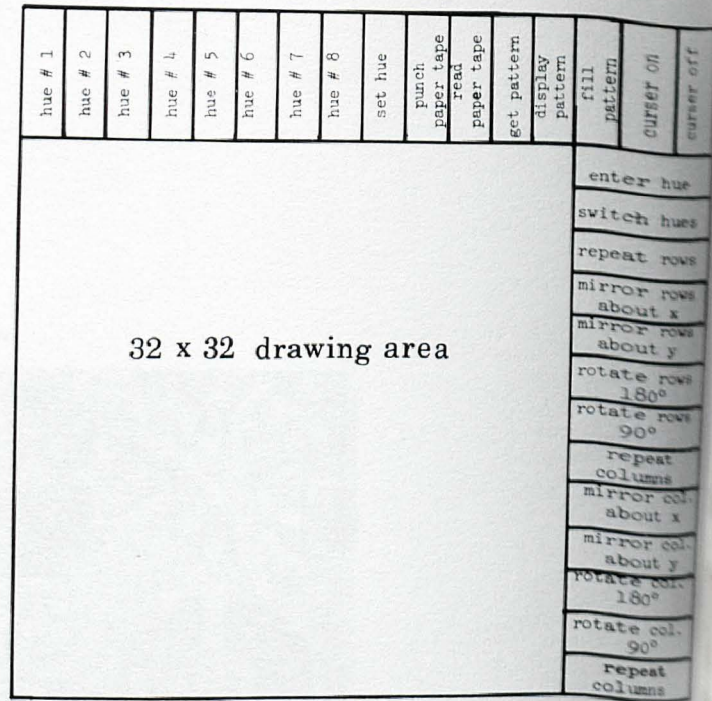
DEBORAH J. OGDEN

Signal Processing Laboratory
 Electrical Engineering Department
 N.C. State University

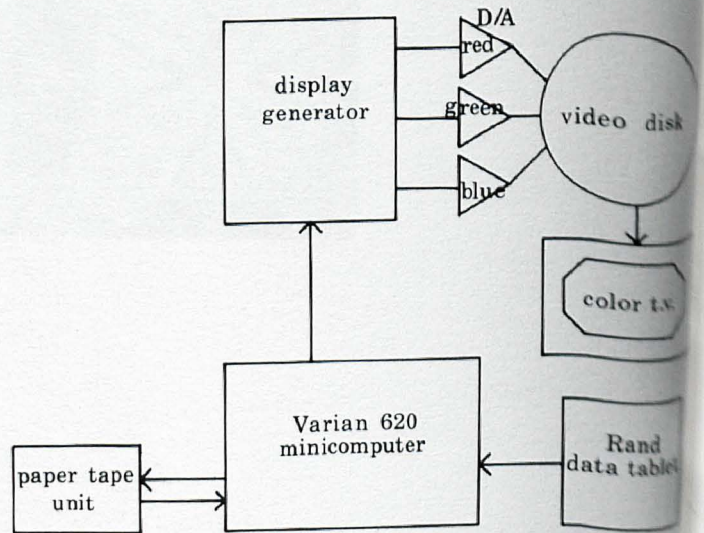
The system described here allows a designer to interactively define and view a color pattern. Means are provided, thru a data tablet and a color television, for describing and viewing a square (32 x 32) unit cell using eight colors. These eight colors may be chosen from the 32,768 definable colors on the system. At any point in the design of the unit cell, the designer may view the cell in a symmetry pattern. All of the two-dimensional symmetry patterns which are applicable to a square unit cell are implemented on the system.

The system is based on an 8K 16 bit minicomputer, a Varian 620. Interactive input to the computer is achieved with a Rand data tablet. The user specifies a command by moving the pen on the data tablet to the appropriate place, then pushing a button. See figure 1 for command layout. The display device is a Sony Trinitron color television set with 512 x 512 resolution. The system relies on video techniques to maintain the display. The computer sends data to the video system only when the picture changes, then the video system refreshes the television once every 1/30 second. Paper tape I/O is used for saving and re-entering patterns. The system layout is depicted in figure 2.

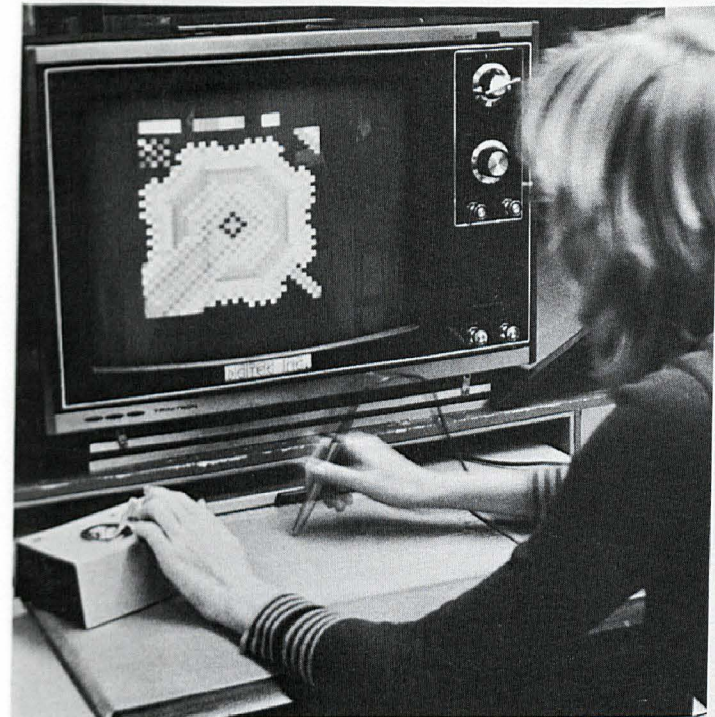
There are basically three modes of display operation, unit cell design, color creation, and symmetry pattern viewing. Unit cell design is achieved by positioning the pen in the draw area of the Rand tablet and pressing the button. A cursor on the television screen helps the user to see where the pen is on his drawing, and pressing the button causes a square of the selected hue to be 'drawn' on the unit cell at that point.



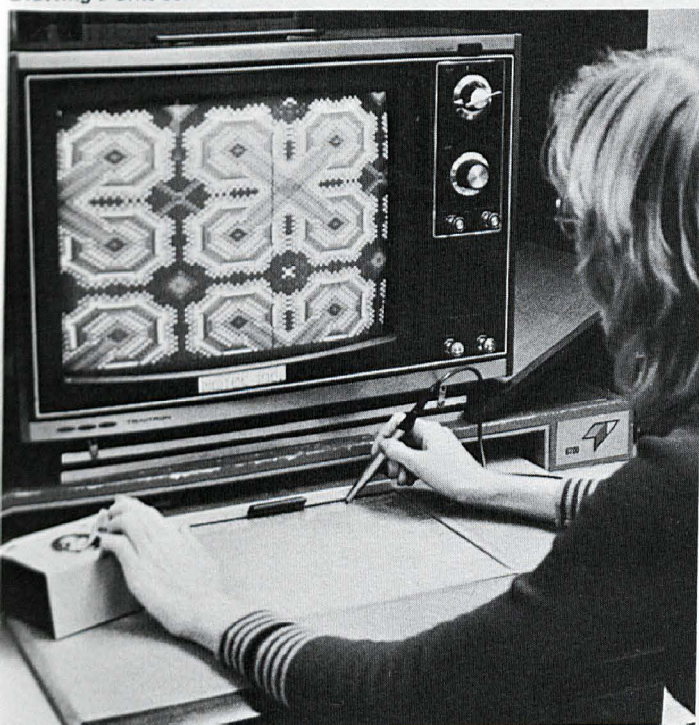
Command arrangement on the data tablet



Pattern system configuration



Drawing a unit cell



Viewing a symmetry pattern

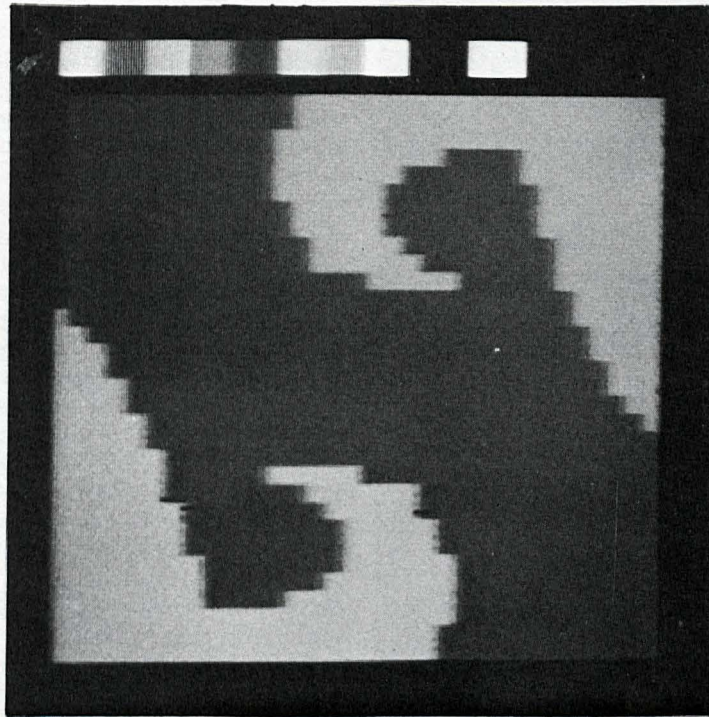
Several of the commands available to the user pertain to hue manipulation. A palette of eight colors is displayed on the television screen and the designer may select any one of these colors to use. A ninth hue is also displayed but it cannot be selected directly. The 'set hue' command allows the designer to enter the color creation mode where he may interactively define a hue in the mixing area, (the ninth hue). Three scales of red, blue, and green intensities are displayed on the television. The user picks the amount of red, blue, and green desired to make up his color, then specifies the 'enter hue' command, which puts that hue into the mixing area. If the color is not exactly right, he may modify the amount of red, blue, and green in it and enter the hue again.

To get the unit cell design back, the user specifies the 'get pattern' command. To start with a blank background as a unit cell, he specifies 'fill pattern', which causes the unit cell to fill with the selected hue. Any time the unit cell is being displayed, the palette area is also displayed. The 'switch hue' command causes the color in the mixing area to be switched with the selected hue. The previously mixed hue then replaces the selected hue throughout the pattern. This also means that any one design can contain only eight colors.

The two commands, 'punch tape' and 'read tape', allow the user to save his design -- the unit cell as well as the eight colors on paper tape. He can then read it back into the system at a later time.

The 'display pattern' command causes the unit cell to be repeated in a two-dimensional symmetry pattern. The unit cell can be repeated, rotated 90 degrees, rotated 180 degrees, mirrored about the x-axis, and mirrored about the y-axis as it is translated horizontally and vertically.

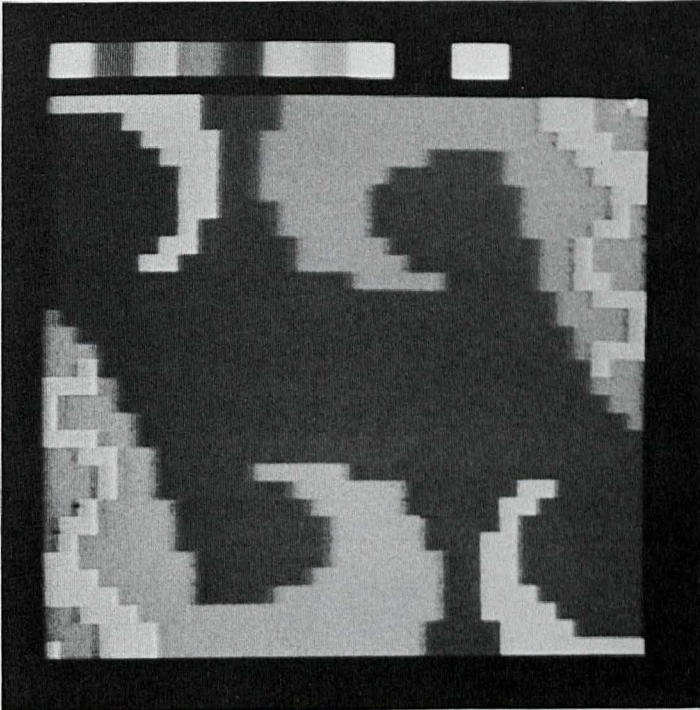
Credit for the system described is also given to Jeffrey F. Eastman, David R. Wooten, James N. England, and John Stauthammer.



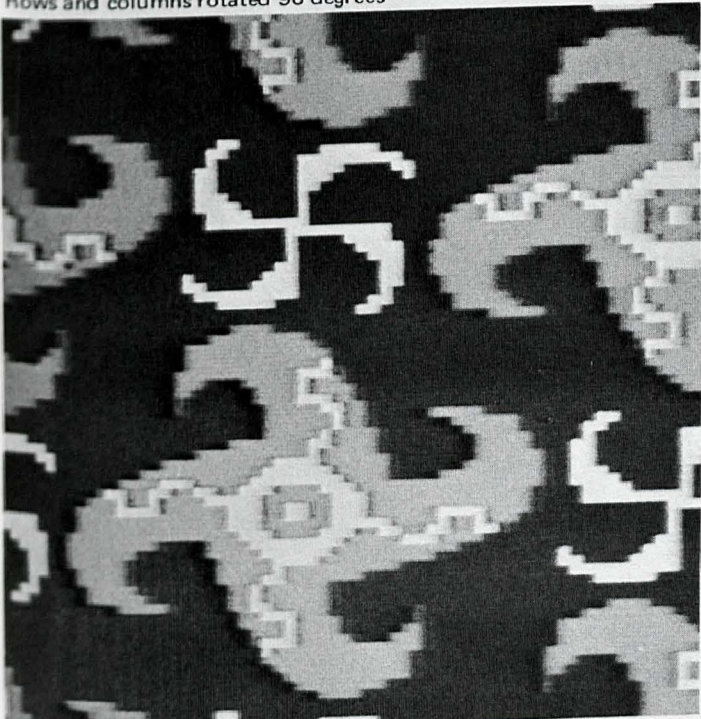
A two color unit cell (Basis for the following four patterns)



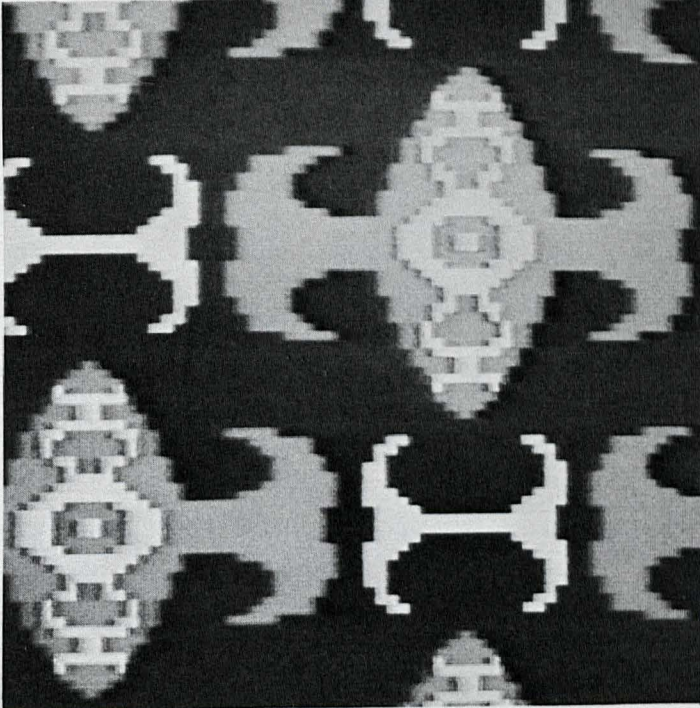
Rows and columns rotated 90 degrees



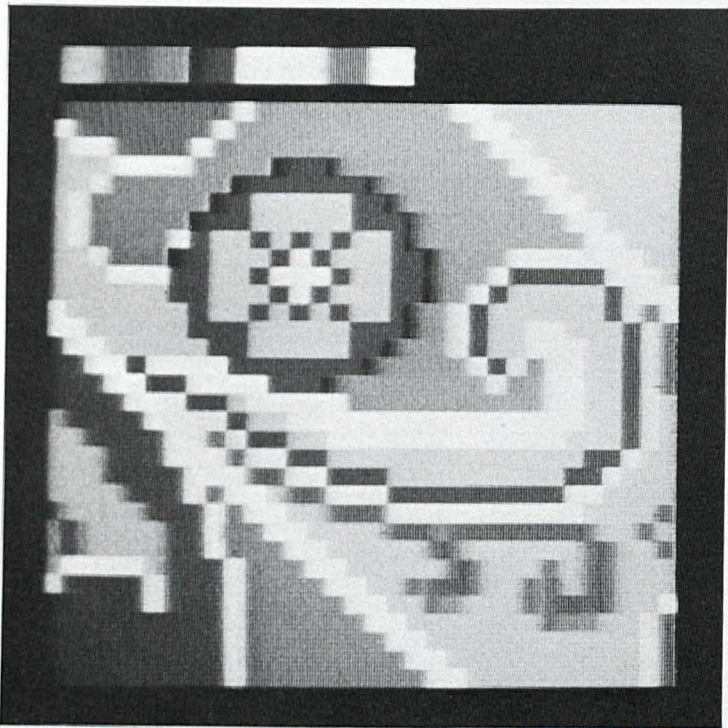
Three color pattern



Four color pattern



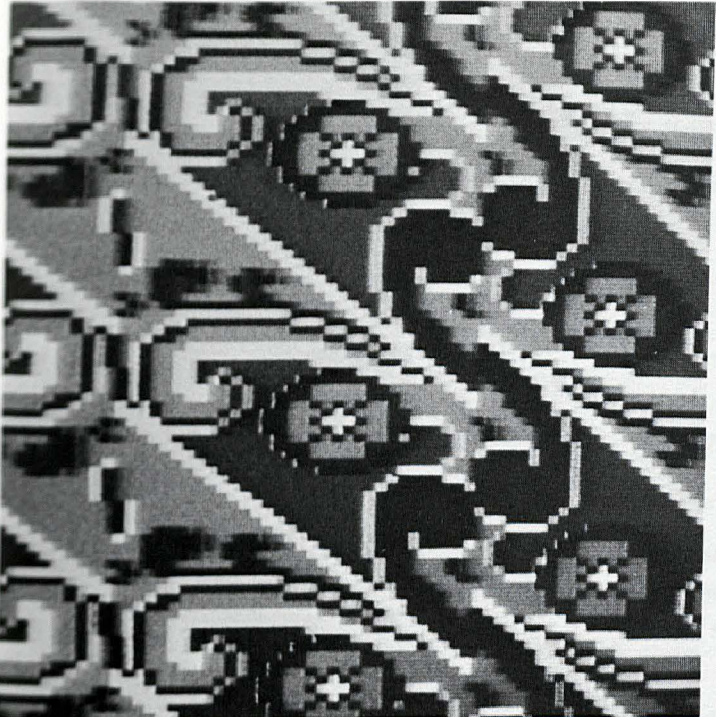
Rows mirrored about x-axis/Columns mirrored about y-axis



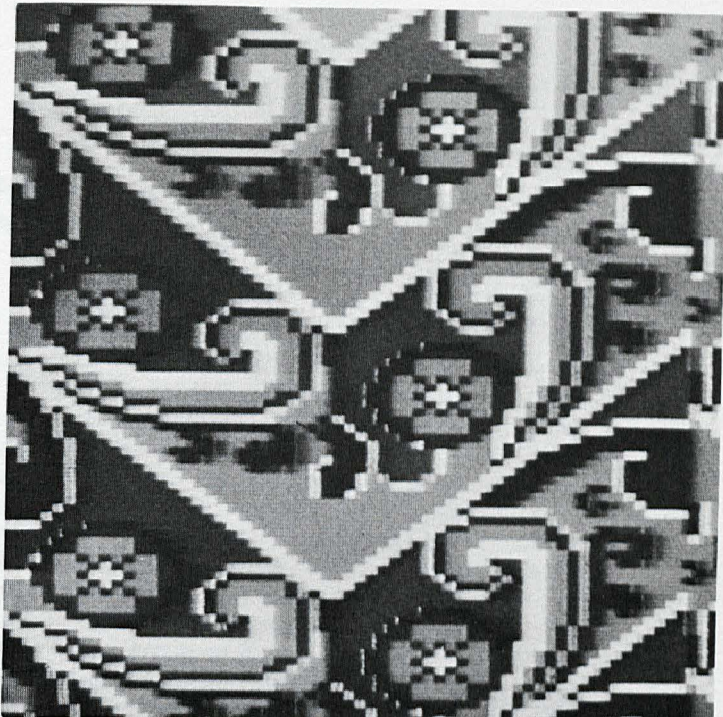
Unit cell designed by David McKendrick, School of Textiles, N.C.S.U.
(Basis for following five patterns)



Rows and columns repeated



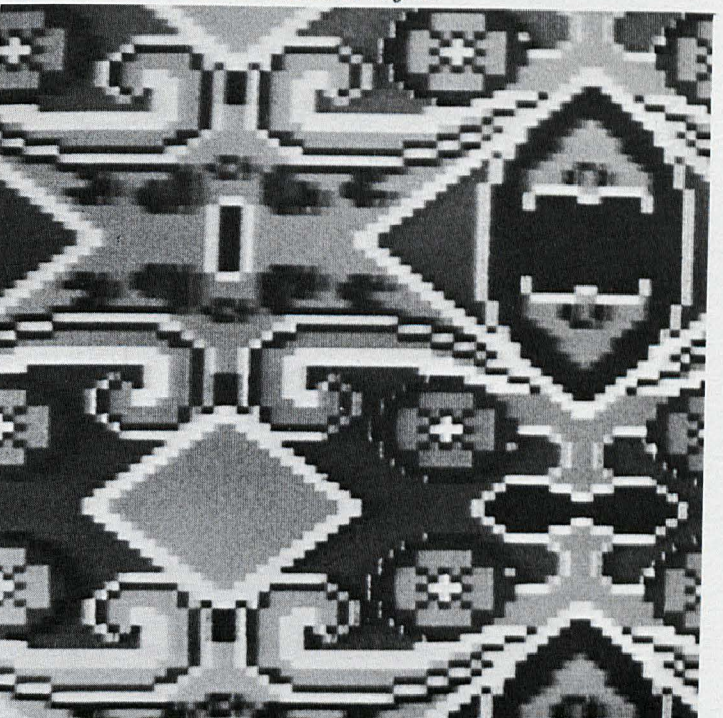
Rows repeated/Columns rotated 180 degrees



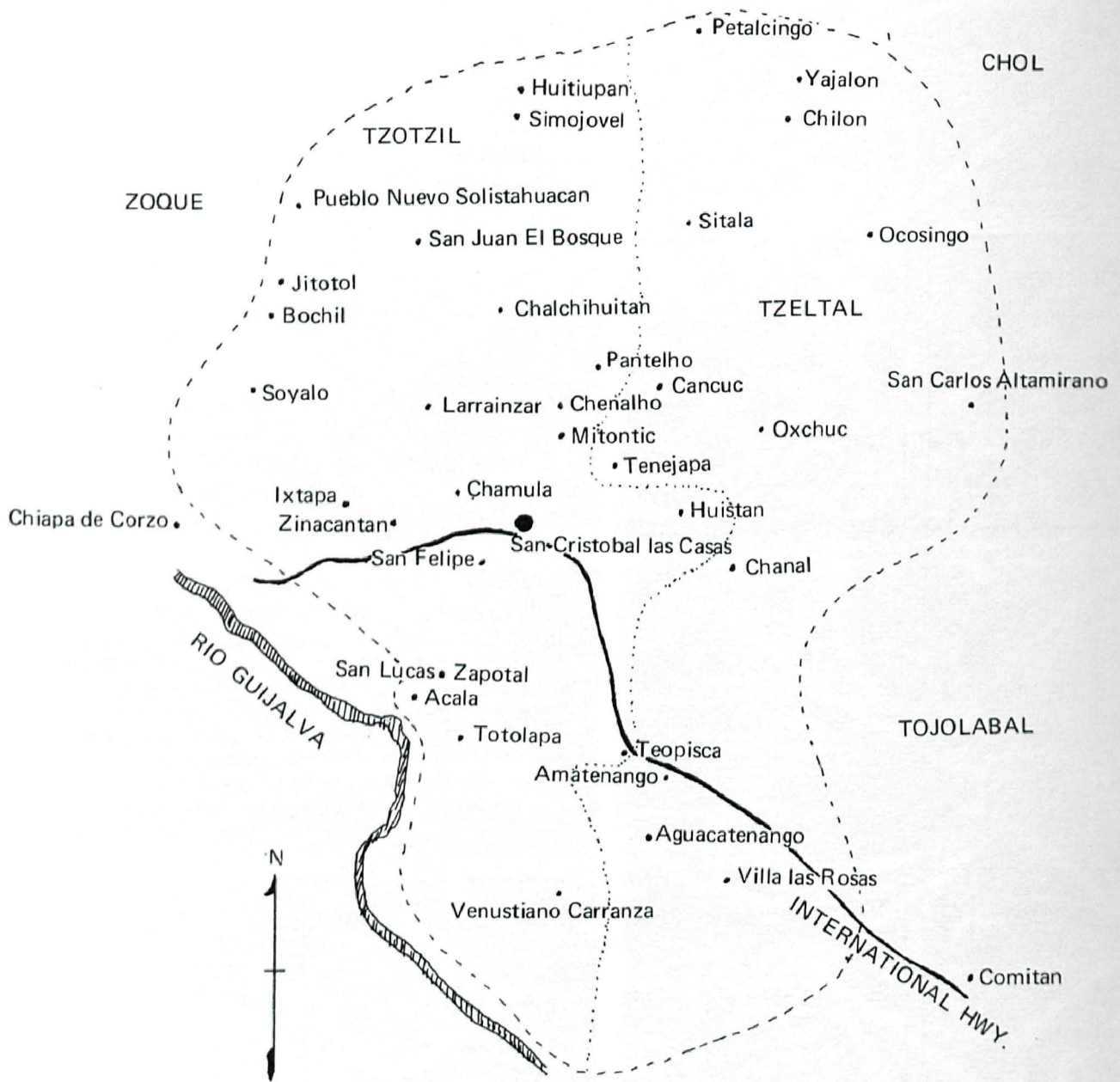
Rows repeated/Columns rotated 90 degrees



Symmetry pattern with rows and columns rotated 90 degrees.



Rows mirrored about x-axis/Columns mirrored about y-axis



MAKING SEEN

The Perception and Generation of Patterns in the
Clothing of the Highlands of Chiapas, Mexico

DENIS WOOD

THE WORLD

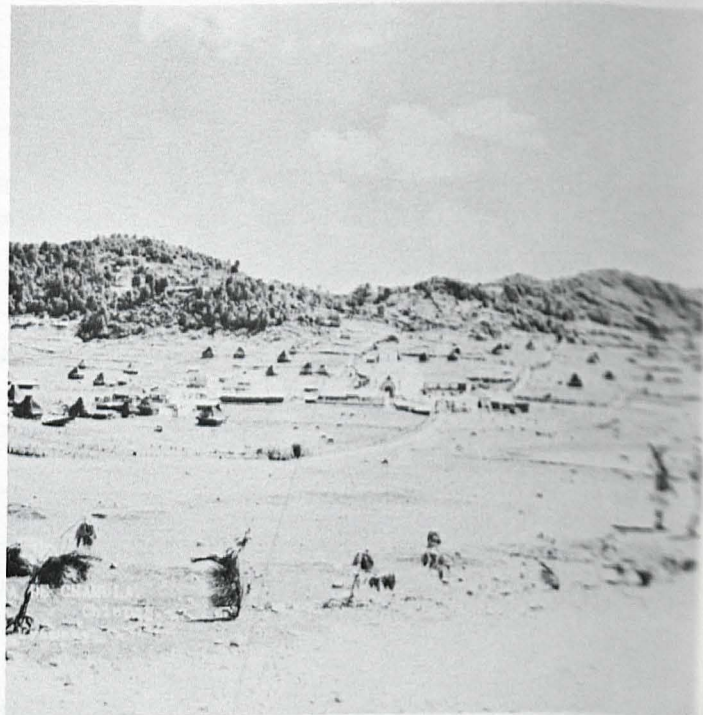
It was raining. We were on our way from Tuxtla Gutierrez to San Cristobal, fifty miles of mountain road, climbing seven thousand feet, and it was raining. And it was raining hard, so hard that each drop of water hit the roof of the cab like an explosion of a hand grenade, but harder than that, so that each explosion was lost in the sound of the larger battle being fought between the cab and the weather. And it was dark, so dark that not even the rain was visible except in the glow of the single headlight. Now and then it would rake across the face of a sign along the highway. Granadilla, it might have said. The sign flew by in the dark and the rain. Periodically I leaned over and cleaned off the inside of the windshield so the driver could see. On the outside, the blades sloshed the water around to little effect. The rain came down behind them like Victoria Falls. More signs. Navenchauc. Nachig. Names that might have connected with something in the daylight meant nothing in that night. Now and then the headlight picked out a white cross or a small roadside shrine leaning away from the road and the driver crossed himself and mumbled part of a prayer. San Felipe Ecatepec. The name meant no more than any of the others, but as we passed it the streams of water on the windshield tossed sparkling fragments of light to me. Gradually they resolved themselves into the streetlights of a city far below us. The driver's grip on the wheel visibly relaxed. He looked across at me and grinned.

'San Cristobal,' he said. As we descended from the pass, the lights vanished and reappeared many times, almost as though the windshield wipers could make them come and go at will. And they shed little enough light on anything when we entered the town. Behind them loomed dark walls, but the shadows, the night and the rain were giving nothing away. We bumped along a rough street and then the dark fell away into an openness and I knew, more than saw, that we were riding around a square. Then the walls and darkness closed in again. We turned to the left and again to the left, running through what sounded like small

lakes as we rounded the corners. The cab stopped. The rain pounded on. 'El Hotel Espanol,' said the cabbie.

We sat in the cab for a while, glad to be alive and safe, exhilarated by the gratuitous madness of the trip. The dark wall beside us may or may not have been the hotel. We really didn't care. After a moment the cabbie got out and, hunkered over against the wet, pounded on a large green door. A small window opened, a face peered out, and then the door swung open. A large man, his chest crossed by bandoleers, stood in a stream of light, bright warm dry yellow light. We had indeed arrived.

We stood in the doorway of the hotel the next morning. The night watchman had disappeared and the light streamed in the opposite direction. The cool hard sunlight did little to warm the chilly portage way and we stepped out into thin clear air. It was a new world. Nothing in the night's journey had prepared us for this place. Yesterday we had been hot in the lowlands of Tabasco. Today we were cool in the highlands of Chiapas. In between had been black and rain. It was like going into a movie theater in the afternoon and coming out surprised into the night, except that here we came out of the hotel into a place we had never been before. It was not birth, but it had about it that quality of the totally fresh. Nothing could be expected because nothing was known. We leaned against the facade of the hotel and looked down the street. It was narrow and the facades of the buildings pushed against the sidewalk. They marched west in successions of pastels, rising slightly to the high green hills that closed the view. To the east the paving ended abruptly. Cobble and dirt carried the street between white facades into the distance, and beyond its end the eye continued and continued, climbing the flanks of a green mountain whose peak was hidden behind the roofs of nearer buildings. I squinted at the light, brilliant in the high thin air, and into the squint trotted a number of small horses. They were heavily laden with large gray-black burdens, and driven by a number of men, bent under similar loads, short and hurrying. These things I noticed incidentally or remember without having ever seen, for my attention was not given to their gestures or postures, but to the way they dressed, in clothes that echoed in me unimagined dreams and satisfied unknown desires. White ponchos fell from their shoulders to their knees, belted at the waist. White trousers, rolled to the knees, and white sleeves, rolled to the elbows, revealed sinewy smooth legs and arms, dark in contrast with the white of the cotton and the wool. Their dark faces were framed by white kerchiefs, knotted loosely beneath the chin, that vanished underneath broad-brimmed cowboy hats of cream-colored straw. On their feet were rough sandals and each man carried a leather pouch. Across their

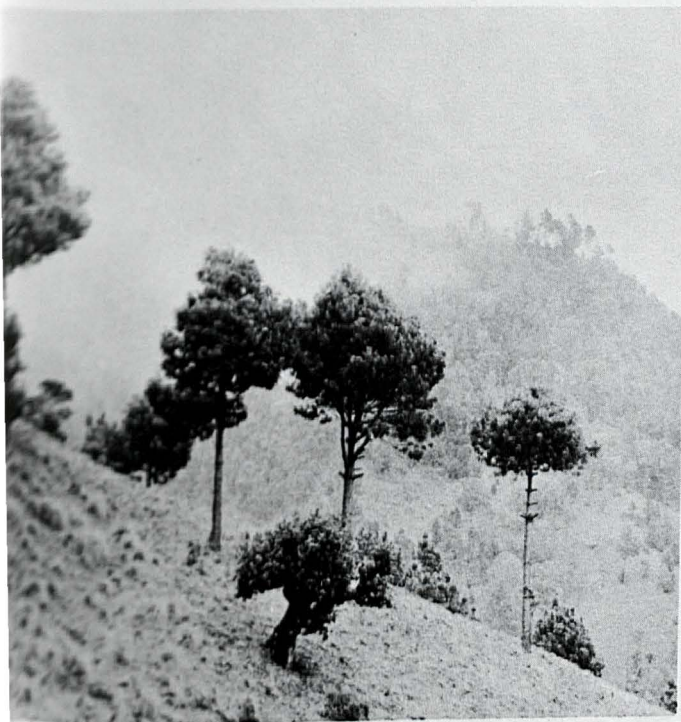


foreheads were leather straps, fastened to the bundles on their backs. As they jogged, the fringe of the ponchos slapped and bounced against their thighs. Some of the men had their arms free but others tucked their hands inside their ponchos, in a pocket-space created by the belts. Three small boys, identically dressed, laughed and played some sort of tag among the horses while their packs swayed violently on their backs. The horses filled the narrow street with a sharp shuffling and the men spoke a language that wasn't Spanish as they hustled past.

If my eyes had first been imprisoned by their costumes, it was their larger presence that came to galvanize me by the time they'd passed: The poncho, and the way they wore it, the kerchief, and the way it cavalierly hung, the sandals, and the way they walked, with a graceful carriage and a pride of bearing that only Fred Astaire could summon in the world I knew. Entranced, transported, we hurried to the corner to watch their progress down the street. The same sharp shuffling of the horses filled our ears at the corner as another group came by. Women and little girls helped drive the horses, shouting and laughing. The women were in black, plain black skirts held in place by bright red sashes below bulky black ponch-blouses. On their heads were folded pieces of black wool, above their jet black braided hair. My vocabulary failed me: shirts and pants blouses and skirts, dresses and jackets, suits and ties, these were my words for clothes. I had no category for the garments on these people passing by. They fit no patterns that I recognized. I groped for words like a four year old and ended just as speechless, absorbed in the freshness of my vision.

We couldn't stand and stare. We dawdled discretely behind them. And so were overtaken. Men passed us in other dress. These strode by in smocks of white with stripes of red hanging to just below their waists. Their shorts ended above the middle of their thighs and their legs gleamed with knotted strength. Bright pink tassels bounced from the ends of purple scarves, and from wide flat hats with the slightest dome of a crown, cascaded a tumult of white and pink and purple ribbons. Bottles stuck out of their leather pouches and as they walked they worked, braids of palm flashing in their hands. They laughed and talked. Black eyes glittered beneath blacker hair. They passed us jauntily as airy and as evanescent as a kid's soap bubble, and as seemingly concerned with the mundanities of this stolid world. They turned down a cross street and we followed at a distance.

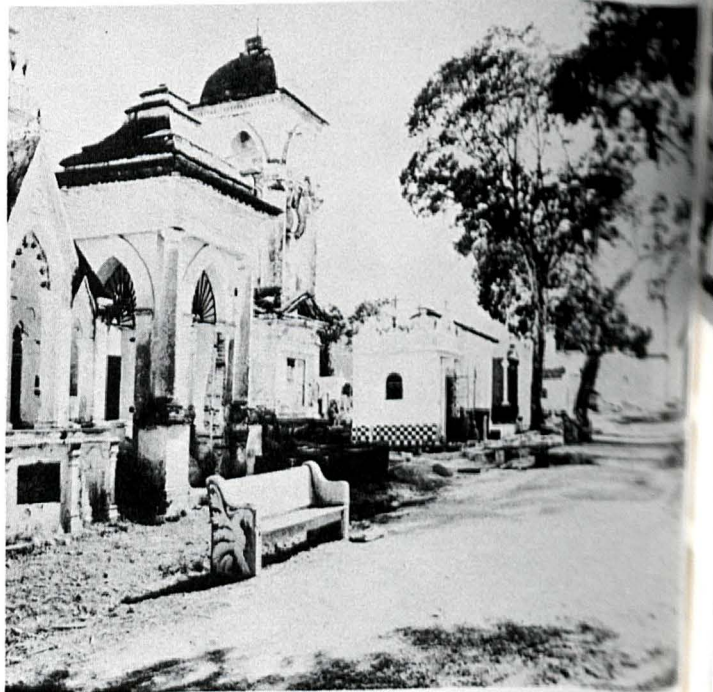
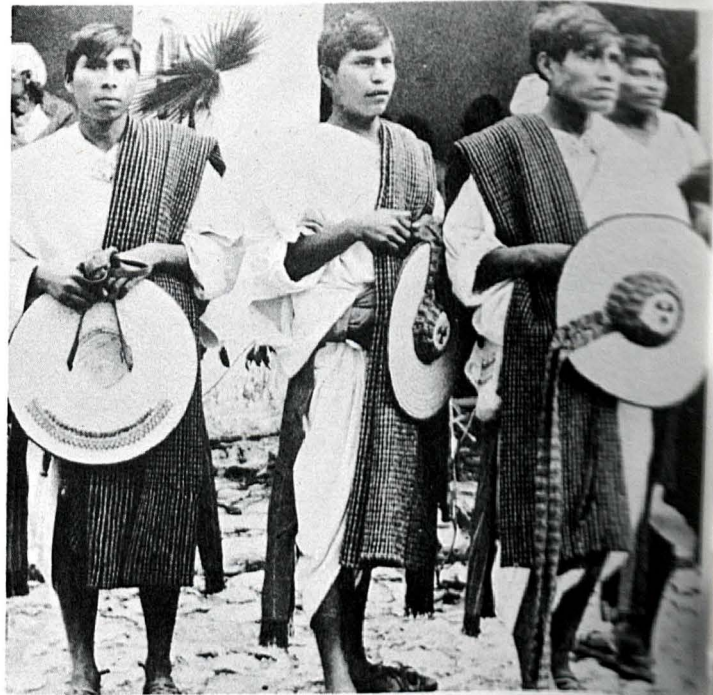
This one was more crowded than the last. Everyone was moving somewhere in a hurry. More men in red and white came by, these with women, their black hair braided but uncovered, their blouses white, their skirts of darkest blue.



One or two had children, babies, slung over their backs in shawls of red and white, striped like the ponchos of the men. Little girls, dressed like the older women, clung to their skirts. Some of these men wore platform sandals and their legs shined as if oiled. Their ribbons were new and tossed the light around like ballons at a fair. Everything sparkled with a freshness that had nothing to do with my eyes. The street was crazy with children. Many wore the pants and shirts, skirts and blouses for which I did have words. Some had sweaters on and wondbreakers. Older women wrapped in flat black shawls and flat black skirts moved more slowly through the throng, heads erect, with baskets in their hands.

We were caught in a human flood. These streets were tributaries running toward some larger river. We let ourselves be carried on its crest. As we moved our senses were massaged by a thousand novel hands. Here men were wearing white cotton garments, neither shirt nor poncho, but some relative to both, tucked into a red sash from which had been bunched up around their legs to make it possible to walk. The tendency to goggle was cut short by their hats, flat plates with the merest hint of a crown, Mongolian looking, which they wore at an angle so cocky that to laugh was to die. A few of these had large black and white striped ponchos, casually tossed over their shoulders. The whole ensemble, diapers, ponchos and hat, was held together by nothing but nerve. Women marched by, in white smocks embroidered with simple black designs in elaborate red and orange woven blouses, in short blouses with white figured on white and gigantic skirts embroidered with colorful motifs of flowers and birds. Hats bobbed above the crowd, some with pointed crowns swathed in ribbons, others with domed crowns in creamy straw, still others in gray felt. We were all moving, all heading for the same place, wherever that might be.

It turned out to be a street, slightly wider than the rest, Along it people were packed the entire width of the sidewalk and spilling out into the street. Large groups of girls, all of the same age and all dressed alike in vermillion skirts, white blouses and socks and shiny black shoes, were lined up along the street. Their teachers urged and coaxed them into something like decorum, Groups of boys in khaki pants and white shirts, their black hair slicked with brilliantine, glistened in the sunlight like so many Christmas ornaments. on a shelf. In the little gestures of the crowd, the way their eyes swiveled east more often than other directions, the way they craned their necks out over those in front of them, the pitch of the voices, the sound of music in the air, it was clear that something special was expected. My brother and I worked our way into the sidewalk crowds and waited with





the rest of them. Now and then a hush would sweep the crowd from the east while all eyes pivoted in the opposite direction. Down the street would come a couple with a pair of kids. They might be dressed in white, the man wearing a smock of white with red bands down his sleeve and a narrow red sash, the woman in a white chemise with color threads worked down the front. They would trot, heads down, up the street through the expectant crowd, the flicker of a smile playing around the corners of the young boy's mouth. As they passed the voice of the crowd would rise, and it would start again to wait.

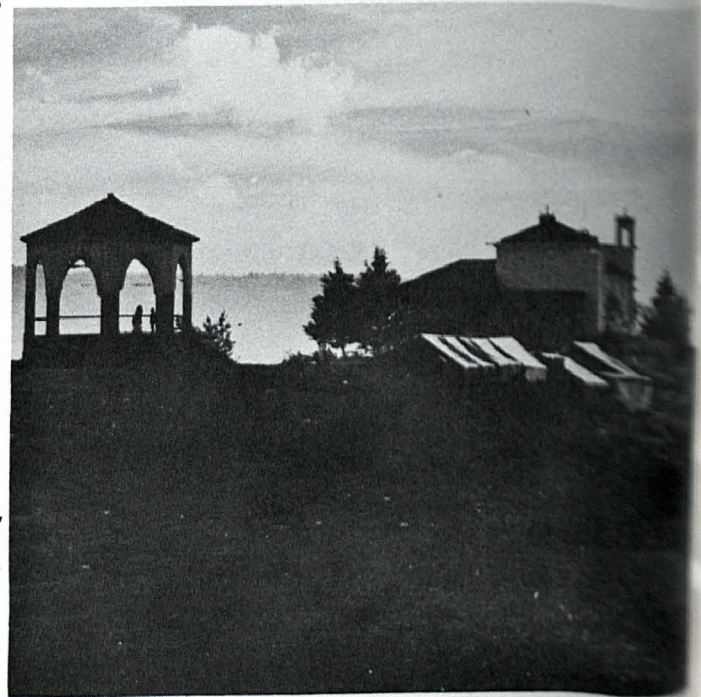
The day was bright and loud. Somewhere in the town a musical band was playing. Maybe there were two of them. Now and then a scatter of notes would rise above the general welter of sound, and then disappear within it, only to rise again from a different quarter, like a fitful breeze. The street we waited on was also bright and loud. The houses marched, cheek on jowl, pink on green on yellow on red, crushed to the edge of the sidewalk, creating a brilliant tunneled space roofed by the arch of cerulean sky. Massive wooden doors and windows barred with wrought iron grills worked their way in broken rhythm down the street. In some of them, mothers nestled, red cardigans draped around their shoulders, their children at their feet. The roof lines too were broken, this one crenelated, that one flat, this one scalloped. In the thin air and the noisy light the facades glowed and glimmered as if seen across a distant water, and yet every detail stood distinct and sharp. The sky above the street was a cobalt blue, that stayed cobalt nearly to the mountained horizon where it wed the world. There, thin bands of pale yellow and creamy white vibrated in an awesome silence above the viridian slopes of the mountains.

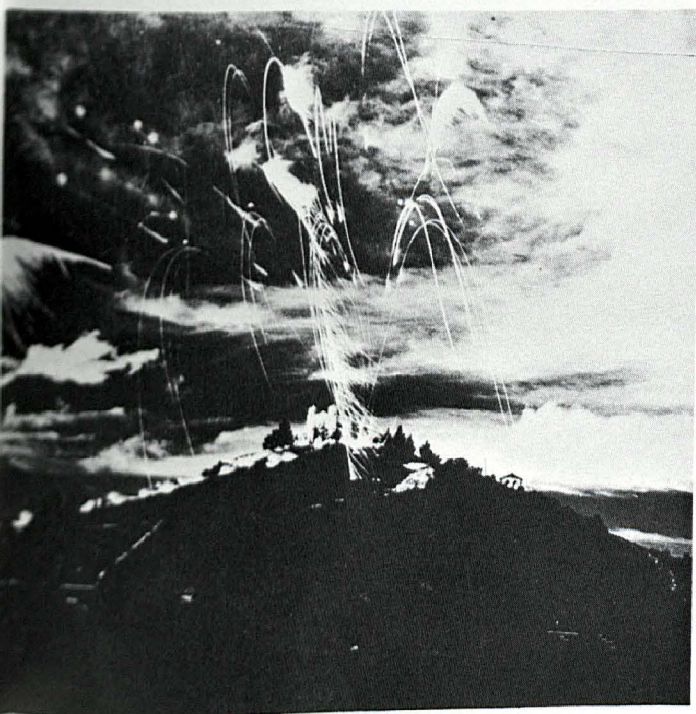
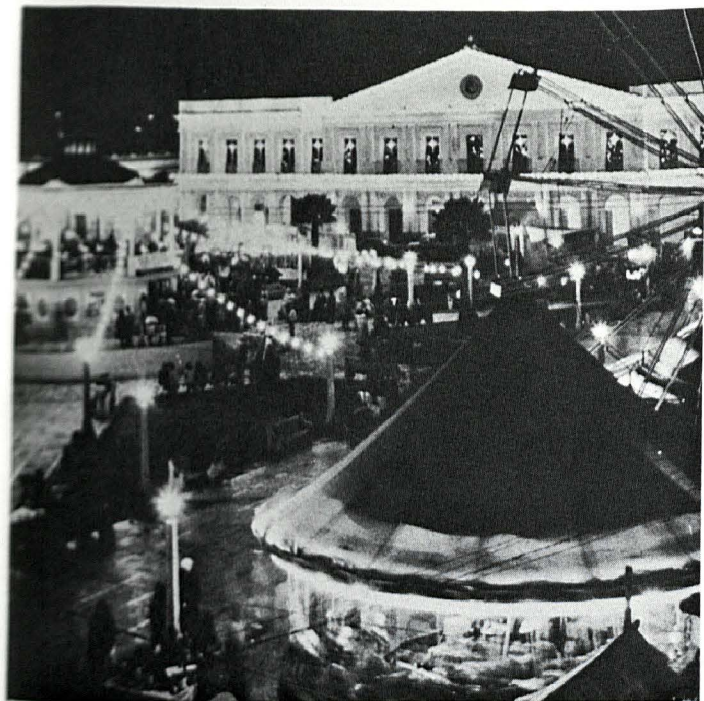
But wait, that hush is sweeping along the street: something is coming. A large motorcycle purrs down the street. A man in a khaki uniform, a large hand gun, and dark glasses surveys the crowd with all the haste of a praying mantis looking over dinner. It is a sign. Eyes remain swiveled east and heads are craned up and into the street. A car comes down the street, a new closed black Ford sedan. Another. Another. Several more. The signs on the sides of the car mean nothing to me, though they are obviously the initials of political parties and/or other kinds of power groups in Mexican politics. Wait: PRI, that one said. Ahh, here comes an open car. A man in a dark blue suit, dark glasses, and a mustaches is waving and smiling at everyone. Men looking like generals or colonels sit beside him. A couple of these. Loudspeakers are coming up the street garbling the message, but my brother begins to understand that the President of Mexico is just down the street. A roar is sweeping the crowd now in place of the earlier hush and for a second I am thrown back to Cleveland, Ohio, where we are standing

in the fifties in a crowd just like this one waiting for Dwight David Eisenhower to drive by. He does at last, on his way to the airport in a closed limosine under a clear domed bullet-proof glass. But here he is. It is Adolfo Lopez Mateos. He too is wearing darkglasses, but is standing in the car waving and smiling. I know nothing about him but I like him this instant. The crowd does too. We all wave back and cheer lustily. Our eyes lock for the briefest part of a second. The school children are throwing flowers and he is gone, farther up the street toward the center of town. The crowd comes off the walls and surges into the street. Most of them follow him to the main square where we learn he will give a speech. But we have other things to do on our first day in San Cristobal. We head toward the quieter inner edge of town where it washes up the side of a shiny emerald hill capped by a small white church, bright and pure in the vastness of the sky. We work our way upward. Few others were on the hillside now. Near the summit we sat down on a couple of gray rocks, squat like turtles, and looked out over the town.

In the west, a long white stair climbed a knuckle of the mountain to a white church domed like Sacre Cuoer, glimmering pristine against the green slopes rising behind it. Between this hill and that, lay the town, the red tiles and the steeply pitched roofs rising and falling like a choppy sea, dirty red. Here and there steeples of white and cream, red and brown poked above the waves like sails. The whole was settled in a bowl, ringed completely by mountains. Only in the north did they gently to a saddle pass. In the heart of all this lay the zocalo, the town's main square. There we saw the crowd, sparkling and colorful, a solid mass at this distance. Music rose in the air, the long line of the lead trumpet rising and falling like the roofs of the town, a reedy instrument, probably a marimba, pattering in the background, now louder, now softer, as the voice of the crowd swelled and subsided. Now in another quarter another band, another trumpet. Elsewhere still another. Occasionally the bark of a nearby dog cut the air and the crowing of a rooster. Individual voices would sometimes reach us. The sun was warm now and the air was softly full of the smell of pine boughs burning. Thin blue smoke filtered upward from many homes. Suddenly rockets exploded above the zocalo, trailing aravesques of acrid smoke. Boom, boom. Boom, boom. It was noon. Beneath us, on steps we had not seen leading to the top of the hill, a couple of people sat. Now they got up and continued their climb. As they came nearer we could see that they were dressed in ponchos, he in white and she in black.

As I looked at them, excitement rose to choke me. I had not been calm with all of this. The utter freshness of this world resonated violently within me, as though the morning were a giant tuning fork and I another. This ponchoed presence, isolated on the steps in the calm of the moment, caused





still more intense reverberations deep within my being. But here, out of the maelstrom, I could attend and hear myself. The rumblings were confused and, as I grappled to articulate them, paled to rhetoric and memories and little more. But so it is, and so it was. As these two advanced toward us up the steps, Robert and Elizabeth Taylor advanced before them, bright in cloaks and silken surcoats. In this prenoon San Cristobal sun, oriflammes, red and gold, lay out upon the breeze, and Arthur the King and Lancelot and Guy charged again and won. Briefly as I raised my head I saw across the valley not a church, but castle, brave and lonely. The middle ages fluttered like its banners and, as if through a mist of aurelian and silver, Genghis Khan charged and whirled with Mongol princes, desperate and fell in their sky-blue cloaks cloaks and blood-red sashes, their ponies dancing mad beneath the sun, the gases long and sere upon the steppe. As their campfires faded, I looked more closely at their faces but it was Gandalf, Aragorn and Boromir that huddled close around that fire, weatherstained and ancient, drawn close around their bodies, hoods pulled low, acts of great heroism lining the very clothers they wore. The morning sun was unrelenting: gone! All gone! Arthur sunk beneath the sorry pool, the Khan long vanished in the steppe's long grasses. Gandalf passed across the sea forever eastward! Gone, but fresh and living in my adolescent soul. When I was four or five my mother made me a Crusader's outfit for my toy rabbit: a white surcoat with a cross of red beneath a cloak of black velvet lined with silk. Bunny was King in those clothes and a great hero. When I was nine or ten my mother made me a Crusader's outfit for my toy rabbit: a white surcoat with a cross of red beneath a cloak of black velvet lined with silk. Bunny was King in those clothes and a great hero. When I was nine or ten my mother made me a cape of dark gray cheese cloth which I wore abroad at night, lurking in dark places and spinning around to make my cloak fly, stalking the night a hero. On its back a white cross floated on a deep red sea, and in this escutcheon I had sewed a ring of secret magic power. And even now, even dressed in khaki pants and a plain plaid shirt, I was such who only month before had wandered out at night beneath the moon, hands outstretched to catch its light, so filling myself with purest moonshine. Like Odin, Thor and Tyr I wheeled my bicycle through the streets of Cleveland Heights, lost in a reverie of swords and cloaks, capes and gods. This is the baggage I carried with me, this and more, of wildness and magic, strength and past, and these bags I opened there upon that San Cristobal hill. Out of them I lifted cloaks of power and of lore, festooned with all the suns and stars and moons of my imagination, and these I draped around the shoulders of the couple coming up the steps, and with these I invested all I'd seen that morning. I would become as they and they would be my dreams forever more.

The couple coming up the stair was just below us now. The black piece of cloth upon her head was like a piece of night, while his broad white hat was like a smaller sun. Black and white, night and day. So lazy in the sun upon the hill above the city I began to pattern this my novel world.

ORDER OUT OF CHAOS

Each of us has the ability to make the world. Like any god, we bring cosmos out of chaos, order to unorder, concept out of percept. Like every god we name what we make, as a matter of course, the final epiphenomenal act of creation that confers concrete reality on the evanescence of events. There on my rock beneath the sun I began the ordering of this new world. I named its parts. These on the steps were Indians, distinguished solely by their clothing. We on our rocks were orteamericanos, Gringos, Americans. Those others, wearing clothes like us, but living here, were Mexicans.

These names I gave, to what did they attach? To these on the steps? To us on our rocks? To those in the zocalo making merry? They attached to none of these themselves. No man by himself is Indian, or Mexican or Gringo. He is these things by virtue of membership in something other than himself, by being one of a collection of things, each of which shares in common with the others an attribute or set of attributes. This collection is a pattern. The statement of the commonality the listing of the shared attributes is a statement of the pattern rule. Each member of the collection is a pattern example¹

This is not a trivial activity. Nor is it nasty, demeaning, senseless, arrogant, or done in fear, necessarily, though it might of course be all these things. To Amy Lowell's wondering, 'Christ! What are patterns for?' John Keats has answered, 'They are largely for the timid; for those who find them comfortable.' But I would answer otherwise, that they are also for the brave, who would swim the chaos and discover a cosmos. Chaos was this morning in San Cristobal and now like Erebus, his son, I would lie with a refraction of myself and spawn Day and Light. And other patterns, Indian, Mexican and American, names of rules that will provide, not answers, but foci from which to ask questions of this my novel world and around which to organize my meaning. And so my thought revolved that morning on the rocks beneath the sun, Indians, Mexicans, Americans. The Indians walked by, unselfconscious in our glance, and the Americans stood up and stretched, exhilarated by the maelstrom of the morning and the high thin mountain air. Clouds were rushing into the valley from all directions and it was time for lunch. We descended the hill to the staccato accompaniment of rockets exploding in the sky, this time by the steps.

Indian was a simple pattern. It included in its grasp all the variations in dress and step we'd seen that morning that we



had never seen before. But little else. It could not distinguish among the modes of dress nor include the other acts of life. But that afternoon, after the rains had come and gone and deep blue puddles had etched themselves along the gutters and into the streets like bits of sky fallen from favor, we set out for La Segoviana, a small shop specializing in folkcraft whose fame preceded it. It wasn't hard to find then. In those days it was just a couple of doors up Guadalupe from the zocalo. We went down the 20 de Noviembre past the movie theater. The street was crowded, mostly with Indians, though there were a large number of people hanging around the theater that didn't really fall under my trichotomic umbrella. These wore pants and shirts all right, but not so that you would immediately think of buying them in a shop in your hometown. They were white, both the pants and the shirts, and very simple and very rough the cloth. The language they spoke did not immediately impress me as Spanish either, and some of them spoke with the passing Indians and joked with them and laughed. Most of the Indians seemed to be heading away from the zocalo. These wore white wool ponchos secured at the waist with leather belts and the women were dressed in large bulky black wool blouses over plain dark skirts. More Indians sat in the zocalo, in family groups on the benches among the formal plantings as if for a portrait photographer, or walked beneath the arcade on the square's west side, or sat on its steps. Here and there on the sidewalk against the walls sat a woman and a child or two, black and brown and white against a wall of fading pink, bloodied in the lowered sun. Most of the Indians that were moving were moving in our direction, up Guadalupe, at whose end glimmered the white domes of the church on the town's far side.

There on the right was La Segoviana. It was the only shop on the street that had glass display windows, and these were small. Mostly the shops just spilled out onto the street, goods tacked and hung around the door, baskets and blankets and pots arranged on the sidewalk around. Things were neater at La Segoviana. Out in front a few Indians stood watching the exchange between an older man, balding slightly, mustached and wearing a cardigan sweater. Also there were a pair of Indians. Signs read 'On parlais francais' and 'English spoken' Although it didn't say so, whoever he was was also speaking something else with the Indians. It sure wasn't any of the languages advertised or Spanish. The cosmopolitan air of this tiny mountain town tucked deep in southern Mexico compared to that of Paris or the Vatican City, and made New York seem like a provincial backwater. The first room of the shop was filled with hats, rubber goods, ponchos and hat covers against the rain, hoe blades and handles, transistor radios, lanterns and sacks containing I never found out what. It was what an American general country store must have been be-

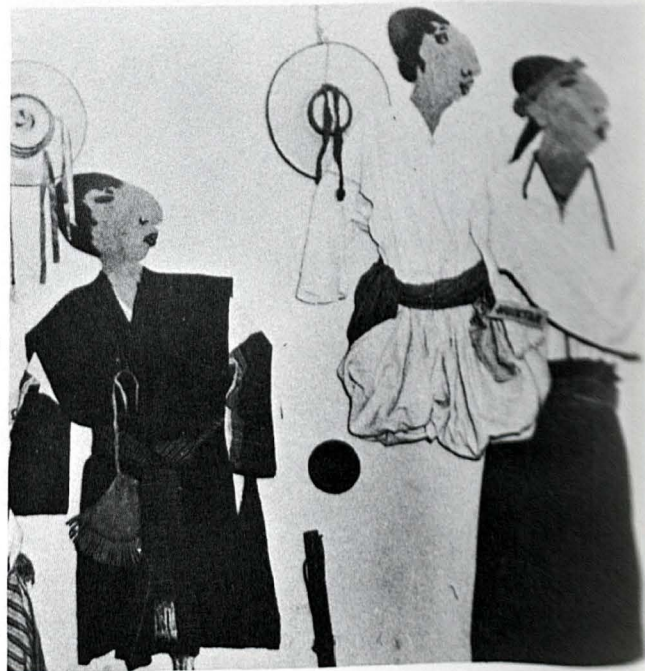
fore they all became Ye Old Time Country Store, filled with candy and calico cats.

It was something I could have stayed with, but it wasn't what we'd come to see. Beyond was an inner room. As we entered the balding man said 'Good afternoon' in English and backed away from the Indians to flick a switch. Lights flooded the inner room. There were tables in a room lined with shelves six feet high and every inch of space occupied by cloth: serapes, ponchos, bedspreads, blouses, strange things for which I had no name, goods by the yard, and probably by the mile. Above the shelves ran walls up maybe ten or twelve more feet. On the walls running around the room were cardboard representations of Indians, in pairs, a man and a woman, dressed in the clothes that I had seen. And named.

Zinacantan the sign said and there was a man and a woman. The man wore his hair in a bowl cut and around his neck was loosely tied a purple scarf with bright pink tassels and from his shoulders hung a thin cotton smock white with fine vertical red pin stripes. The hat above him, flat against the wall, was of straw, and pink and white and purple ribbons hung from it. Beside him, in braids, stood a young woman. Her blouse was white cotton with the breast worked in horizontal rows of red. Beneath it hung a deep blue-black skirt of cotton, dressed like her younger counterpart except that over her shoulder hung a black and white checked piece of woolen cloth.

Next to these stood another couple. The sign said Tenejapa. The woman wore a blouse of white cotton, highly decorated in red and orange around the neck and along the shoulders. A necklace hung around her neck. Dangling near her head was a piece of white cotton decorated with bands in orange and red. Her blouse was tucked into a skirt of the same deep blue-black cotton bound with a sash of red, six inches wide with stripes of black running its length. A large cotton bag hung next to and a small one hung from her sash and both were worked in bands of red and orange. The man wore a very large wool poncho, stripes of black and white, alternating and a sash of white whose ends were worked in the same bands of red and orange. The hat above him had a pointed crown and ribbons.

The man and the woman next to them were lightly clad in cotton bags, chemises perhaps, he with three stripes on his sleeves and a sash of plain red cotton, she sleeveless but with small colored rectangles spotted here and there, and a ring around the neck worked in red. Cancuc red the label. So they wheeled around the walls: Larrainzar San Andres, Huistan, Chamula, Ocosingo, San Bartolome, perhaps the Lacandon as well.² The smell in the room was warm, complex: fresh and untanned leather, wool still rich with lanolin, wood, the aroma of burning pine, and other smells for which



I still had no patterns. The balding man came into the room and introduced himself as Joaquin Hernanz. He was very helpful. The labels on the cardboard figures were the names of the towns from which these Indians came. So, these were from Chamula and were called Chamulas, while these were from Zinacatan and were called Zinacantecans. On the other hand, these here were also Chamulas, but from San Andres Larrainzar while these from Chenalho were called San Pedrans. It was at once obvious that whatever the pattern, the pattern rule was not going to be simple to lay out. That became increasingly obvious in the next half hour, as we looked about the room. In the piles everywhere lay sashes, smocks, ponchos, and other articles of clothing. I would look at the figures on the wall, try to articulate the pattern rule, and test my understanding by naming the town from which it must have come. Right now, then wrong. I began to plumb the nature of the variations each pattern rule included. This sash, basically white with fine pinstripes of blue and red, and the richly decorated ends, done in small diamonds of green and red and orange with a row of little dancing men: where was then pattern? Was it the white cloth with decorated ends that placed it squarely in Magdalenas? Or the small diamonds? Or the red and orange or green? Or the fine pinstripes? The white cloth with decorated ends, examples of this were to be found in the Tenejapan pattern; while diamonds in red and orange and green popped up in Santa Marta. What I was trying to do, mathematically speaking, was 'compute the invariants in a set of sources under various transformations, or, putting it differently, to establish what is common in all lions that we may identify them as one of a kind or in all vipers that we know them to be different from lions, representing a class in themselves' (Foerster, 1969b, 3). What was invariant in these many examples of sashes from Magdalenas? Or these huipiles from Tenejapa? Or these ponchos from Chamula? What, in other words, was the pattern rule?

Dazed by the colors and the shapes, consumed with desire to buy them all, I stumbled out into the darkening evening. The sky was mad with sunset. It suffused the street with a damson glow against which the lights of the shops laughed and danced. It was like Manhattan at Christmas on this crazy street in this little far-off mountain town. Across from La Segoviana the proprietress of a hole-in-the-wall beckoned to me. Around her door-frame hung black and white wool ponchos. I looked them over, with the critical eye of the hard to sell but she had already sold me. There was a black poncho of a wool like velvet. The V-neck was outlined in fine white stitching. It was sewn up the sides and had arms like an American sweater, and two big loose pockets. I forget what she wanted for it, or what I paid, but the haggling was short and sweet, and I walked off down the street with a Chamula pon-

cho tucked securely beneath my arm. Back at the hotel I went to my room. I fumbled the key in the door in my excitement. I called for my brothers to see if they were in. They weren't. I stood before the mirror and pulled the poncho on. My glasses fell to the floor and I bent to pick them up. Putting them on I looked into the mirror. Something new was there, not just me in a black poncho, but my whole past world and a new one too. Not just seen, but in that moment dimly understood, a set of possibilities, interlocking patterns meshing into meanings. Something was unlocked in that instant. I laughed like a baby looking for the first time at a mirror and like the baby my eyes opened wide with wonder. I laughed again and twirled before the mirror.

ORDER INTO STRUCTURE

The clothes turned out to be the key, of course, that unlocked the door of the highlands. After understanding the clothes, everything else was easy. It took time, many visits, many books, many conversations, but in time it all became very simple. I'm talking about the structures, complex patterns, that seemed to underlie everything I'd seen that morning, the structures within which everything was organized the structures which once I understood them allowed me to participate in all of it. Understanding them didn't make me an Indian or a Mexican--that could come only with time I never even had- but at least it helped me see more deeply into the structures of my life as an American. Shit...I don't even know if it helped do that, but piecing them together was sure a lot of fun.

A. COSTUME AND SOCIAL PATTERNS

The first set of patterns were the most important; there were Indians and non-Indians, and the Indians wore those crazy clothes, and the non-Indians didn't. In those broad hats with wild ribbons or those white chamarras hanging to the knees you could tell an Indian a mile off. Everything left over just wasn't an Indian. Yeah, but it wasn't quite that simple, because because the stuff left over was a lot of different things, things like Spaniards, meztizos, and ladinos to start off with, not counting the foreigners, both expatriate residents and tourist. But while they turn out to have a role here, let's you and I forget about them for a while and deal with the others.

San Cristobal is home for some maybe thirty-thousand people and not a one of them is an Indian. A lot of them were once, but you can tell that they aren't now by the clothes. It was settled by Spaniards in the 16th Century, but it grew by intermarriage. Indians and the children of Indians and Span-

iards and just plain Spaniards made it the town that it is. Those children of Indians and Spaniards are meztizos and during the four hundred years they have come to be the bulk of those living in San Cristobal. And the rest of Mexico. They are the Mexicans: everybody else is something different, Indian, Ladino, Spaniard, Gringo. While the Mexican is not an American he is someone you would recognize. He is a Catholic and in this part of the world an urbanite. He speaks Spanish and goes to the movies and follows the international soccer scene and sometimes even American baseball. He knows who Rafael is and Armando Manzanero and Favio and even the Beatles, and he usually likes John Wayne, especially in Westerns, He is either a shopkeeper or a cabdriver, a millionaire or a pauper, a doctor, a lawyer or anything--except an Indian chief. In San Cristobal most of the Spaniards fit this pattern too; except for the color of the skin and maybe the eyes, and except for an excessive amount of social prestige, it's pretty hard to tell the meztizo from the Spaniard. Here they're both Mexicans, and that means something.

Benjamin Colby says it means that they are part of the nation at large. He says (Colby, 1966, 20) that in this 'society there is a very strong historical awareness extending all the way to the time of the conquest,. Mexico City is the Mecca for all culture. Further most people in San Cristobal are extremely patriotic and exhibit a strong desire to acquire status for Mexico on an international level.' These people care about MEXICO, that whole big country, and its place in the world and in the history of the world, And they live in that whole big WORLD and in the history of its time. And all this shows

I've read a lot of Mexican shirt labels. They're like American shirt labels: mostly home-grown stuff, but the names Japan and Taiwan show up too. It's shirts with button-down tabs, and jackets with lapels that are wide this year but narrow the next, and print skirts and pretty little blouses with plastic buttons and ties and the whole routine. And by looking at a Mexican you can make the same judgments about sex and age and class and profession that you can make in this country and the Mexicans do, and those that want to be respected bad enough dress their little boys in jackets and ties on Sunday just like those that can afford it and shoeshine men can make a real living keeping the sun bouncing off the Corfam. And the patent leather. And the tourists go crazy getting their shoes shined everyday out in the Zocalo by their favorite guy and pay too much everytime. I ought to know.

The thing about these clothes is that like the people that wear them they are part of the big world outside. It may take a little longer to get here but the changes set in motion by the Paris couturiers are felt here sooner or later. The clothes worn in San Cristobal are meant to reflect the place of the city in Mexico and the place of Mexico in the world.

The young machos shine and dazzle in whatever affordable is most current and the substantiable business men are proper in heavy dark glasses and dark suits. These people know the score clotheswise: they measure you by the quality of your shoes. Get 'em shined: everybody notices. A lot of people have studied the mechanics of all this, the nature of what we know about a person in that first fateful glance (Rosencranz, 1972; Bathke, 1968; Eddy, 1965; Vener, 1957; Knapper, 1968; ad infinitum) and it's not all clear but a couple of critical things are. One of these is that dress in this sort of society comprises a tricky code, one that smooth operator can use to his advantage, but which always gets the unfamiliar in a jam, and which a caring society takes care to obliterate by putting little kids in uniforms at school, like the kids lined up to wave at the President of Mexico, right here in San Cristobal. Clothes in this kind of situation are a badge but a badge you can buy and learn to flash with cool or throw away. As you will and as you can. Another thing that's clear is fashion, the flexible always changing rule book that means you've got to buy that badge today, tomorrow and again and again tomorrow. It keeps the mills going and helps sharpen those distinctions because not just everyone can purchase fifteen pairs of pants a year. Two things: the code of class and fashion the cop, of the world and in history. San Cristobal's something: they know what's up to date in Tuxtla, Mexico and New York City.

There's another group of people here in town: Ladinos. Colby says that 'the town dwellers speak Spanish and refer to themselves as Ladinos' (Colby, 1966, 5) but he also says that 'Ladino' is 'A word originally used to refer to those acculturated Indians who were able to speak Spanish. Ladino also means literally 'cunning' or 'crafty' as some of the more informed inhabitants will point out' (Ibidem).

Colby's second definition is closer to what I have experienced than his first, the people in town--Spanish-speaking cab-drivers and shop-keepers--calling themselves "Mexicanos" or "mestizos", the Indians "indios" (and other things), and the acculturated Indians "ladinos" along with the mestizos living in the Indian communities. These especially they call "Ladinos", pejoratively, as if they couldn't understand why any sane whatsoever color-blooded Mexican mestizos would want to live with the Indians out in the country (see further Duby, 1961, 9-10). Miles relates an incident that supports my interpretation of what the townspeople call themselves. She is having coffee with a Senor Dorres of the National Indian Institute, who, referring to the Indians says: "They feel superior because they are pure Indian whereas most of the Mexicans are what they call 'ladino'-a mixture of Spanish and Indian--mestizo we call it" (Miles, 1961, 107). The point is that it is the Indians who call the townsfolk of what ever

sort "ladinos" not the townsfolk themselves, unless of course, they are. My sense of a ladino is that of an Indian who stops being an Indian. He stops speaking Tzotzil or Tzeltal and stops farming and working with his hands (Colby, 1966, 24) if he possibly can, but most obviously and most critically and most dramatically he changes his clothes. He takes off his chamarra and his sash and his hat of palm covered with crazy ribbons and puts on clothes of fashion. Yeah, except he'd out of fashion because he's poor and because he doesn't know the code and because he's been living in a culture where the bare idea of fashion would make as much sense as nudity at high noon in the zocalo. You can spot a Ladino at fifty yards: he's wearing our clothes except they don't fit in the first place and in the second place they're homemade out of rough white cotton or maybe the shirt is a plaid but fifteen sizes too big and in the third place they don't fit in the first place. But that's not all, of course, because he still walks like an Indian and talks like an Indian and shakes hands limply rubbing palms, just like an Indian. And by the time he grasps your hand hard he'll also be getting his shoes shined and he'll be a meztizo of types, or his kids might be and he'll be wearing his patron's old black jacket to the movies on Sunday afternoon. And he'll drink tequilla instead of pox, but when he's drunk the bolonchon will still whisper in his heart and his soul will cry. He lives in a perpetual twilight, neither in the Indian timelessness near the navel of the world, nor in the speck that's San Cristobal in the space and history of the planet earth. The wound will heal, but the endless sears lie in Mexico like a flame.

He could go back home; he could move out to his old country, speak his old unforgotten tongue, and change his clothes. He could become an Indian again. There's something fluid about the nature of this boarder that's purely cultural. Colby says "a great number of Ladinos are phenotypically indistinguishable from the darkskinned Indians who live in the surrounding hinterlands" (Colby, 1966, 6). Keep in mind that he is talking about all the Mexicans in San Cristobal when he says "ladinos". These distinctions among Mexican, Ladino and Indian are not crucially of the skin, but of the culture, whether one is of the earth and in its history, or of a smaller place consciously standing out of time as we know it. There is the Indian, out of our history, out of our world. Colby says:

The improved road facilities have caused an important increase in traveling activities of Zinacantecan Indians but only rarely has one ever been as far as Mexico City. Most of them, however, have some vague notion of this metropolis. Some myths about wars between Zinacantan and the people of Chiapa de Corzo exist. More elaborate accounts of the Carranzista revolt are told, but outside this we have found little in the way of historical knowledge in Zinacantecan stories of myths, least of all any explicit references to the conquest. (Colby, 1966, 20).

These Zinacantecans that Colby writes of, they live in something called a municipip, sort of like our country. This municipio is split by the Pan American Highway. And the major settlement in this municipio, called a cabecera, more or less a countyseat, lies six miles by the road by San Cristobal. And these people have a vague notion of Mexico City and a history whose furthest edge lies not much farther away than 1900. These people do not wash their feet in the history of my world: they don't even stand on its shores.

Gossen has described the cosmos of the Chamula who live a little farther away and not on the Highway. He talked to a lot of them and even had a few draw maps for him (Gossen, 1969). The biggest part of their universe lies in the Highlands of Chiapas, on the plateau, but it slopes down into the lowlands where the Chamula work the farms of the Zinacantecos or on the plantations of the Mexicans. It is bounded by the Pacific to the west and south, and the Caribbean to the north and east. These waters meet creating an island in their midst. This is the universe of the Chamula. Its center, the very navel of the world, is in Chamula, near its center, San Juan, its cabecera. Their notion of time envelops this space like a tent. At the peak of the cone is now and events recede down its slopes into recent, then distant history, finally into mythological, cosmological past. Space and time are co-related: distance in feet from the navel in Chamula is equated with distance in time from now, into ultimately barbaric past. Being up-to-date in Chamula doesn't mean wearing Yves St. Laurent but knowing the manners of society, Chamula manners, that is, and chances are that if you're out of it, out of tune, out of keeping, likely to offend, uncouth, barbaric,. Most Indians feel this way, and most Indian communities harbor a navel of the world (for a map of the sacred geography of Zinacantan see Vogt, 1969, 375-376). It is the ultimate in ethnocentrism.

In the end this question of the Indian cosmos is not so simple. Each community runs a slightly different variant on the same deep and only vaguely visible theme. Writing of the ancient Maya--and all the Indians of these highlands are Mayan Leon-Portilla says:

The Maya art and science of measuring time, probably born before the beginnings of the Classic period, extraordinarily elaborated through the latter and with diminished strength even in modern isolated communities, integrated a culture pattern, the basis of many other institutions. In this pattern the Maya found norms for everyday life, for astrologic knowledge for the order of the feasts with their rites and scarifice for their economy, agriculture and commerce for their social and political systems. (Leon-Portilla, 1973, III-112).

While the form of the conception of time and space may differ in the contemporary Maya--the Tzotzil and the Tzeltal

and the others-the function does not. It still intergrates a culture pattern. To a certain extent it defines the culture pattern. One thing it does do is provide an ahistoric frame within which all else is arranged. Its cyclic nature incorporates nothing that cannot occur again, ignores changes, and so creates a sense of timeless process in which one is always up-to-date, in the temporal center., by never doing anything other than it was done before. Thus the space-time universe of the Chamula, for example, may be seen as revolving slowly around the Chamula, at its space-time center, in nested cycles, some turning annually, others less often. I am not doing violence to their beliefs when I cast them in these forms, so much as grappling to make them simple enough for me. I live in history. When the spring comes, it is not for me come back again, but something new, come for the first time, a three month stand that will never play again. It is not thus for the Indian: spring comes back again, and again, and again, as the world turns. The year gone does not recede into a part down the cone of history, but comes again. Leon-Portilla says: "Isolated from time, space becomes inconceivable. In the absence of timecycles, there is no life, nothing happens, not even death"(Leon-Portilla, 1973, 86). For me too space is inconceivable without time, but for me cycles are just as inconceivable. But for the Indian it is almost all, his history nothing but a set of variations, random fluctuations, dragged from the cycle against his will.

While these recurring cycles underwrite and justify the rightness of things Indian, they also integrate them. All Indians of the region are subsistence farmers, mostly raising maize and beans and squash, some fruit and maybe this or that else (Laughlin, 1969; Villa Rojas, 1969). Every year, seemingly recurrent, actually recurrent if that's how you conceptualize it, the fields must be prepared, the planting done, the crops tended, harvested, stored. None of this is new each year, but a remanifestation of the way things really are. Every year the rains come and every year they stop, recurrently unchanging. And wholly integrated are the fiestas and celebrations and reaffirmations of these cycles, not parallel activities of religious nature, but identical manifestations of the yearly cycles. And every year different men participate as celebrants, year-bearers almost.

Almost all extant Mayan cultures have some sort of cargo system and it is especially prominent in the highlands, both in Chiapas and Guatemala. It is a set of civil-religious positions, obligations. Most of them are related to the Maya-Catholic saint cult. A man fills a cargo position for a year, and during that time he tends to the saint, keeps the flowers for the various celebrations and observances, organizes and arranges the fiesta in his honor. General priestly stuff like that. Only this priestly hierarchy is not a fulltime job, one doesn't train. It is a developmental in that one doesn't grow into priestly

competence, but fulfills these functions as part of the definition of what it means to be an Indian, like raising corn. Nor are the activities associated with the positions things that have to be done to assure the continuance of things, but things that are done as a definition of life. These are not so much acts of propitiation as sets of life, as natural as good manners.

There is one developmental historical aspect to the cargo system, but it has an adevelopmental, ahistoric consequence. The positions are arranged hierarchically, so many on the bottom, so many on the next level, fewer on the third, and fewer still on the fourth and highest level. A man gains prestige in his community by holding these positions, and he gains more prestige by holding successively higher positions. (Prestige may also be gained in other ways.) It is not easy work. A man gives up a year of raising crops to hold a cargo, and usually moves from his home in his paraje in the country to the cabecera of his community. And he usually squanders his savings and goes into debt too. Only the best farmers can move up this ladder to the top for only they can acquire the necessary bread to do so. And in the process of moving up this ladder of prestige they squander their capital. It is difficult to amass wealth as we do because of this, and next to impossible to pass it on. It is a method of rewarding farming competence, and translating this competence not into increased material wealth, but enhanced prestige which dies with its holder. And so classes don't develop. As the cycles revolve wealth is pretty evenly distributed throughout the community. In such a situation economic development is proscribed and the next cycle reveals things to be as they always have been and as they always will be. The cycles of this world are not merely read in nature but preserved by man. Cancian (Cancian, 1965) says that the cargo system is the core of highland Indian culture, at least in the case of Zinacantan where he studied it. Colby thinks that Cancian overplays its importance though he does not deny its central role. Colby says:

The cargo system is certainly not 'crucial to the continued existence of Zinacantan as an Indian community separate and distinct from its Ladino environment' as Cancian feels (1965, 133). Individuals who do not take cargo are no less Indian than those who do: In fact the last President elected by the Zinacantan community had previously refused to take a cargo. (Colby, 1966, 56).

But then Colby spent more time talking to those who had not made the climb to the top, and his assertion is probably not so much overplayed as ill-thought. I mean, you don't have to be the President of the United States to be an American, but that doesn't mean that the institution isn't a defining part of

the larger picture. Let's take it that the cargo system plays a central role in Indian life and maybe a defining part of the culture as a whole and that it emphasizes and helps maintain the ethnocentric world view of the Tzeltalan in a way that is as natural as breathing.

This ethnocentrism becomes even more remarkable in its geographic context, for it is a communal ethnocentrism embedded in a sea of ethnocentrism founded in a matrix of historic nationalism. There are about 180,000 Indians living in the highlands, maybe more, and speaking either Tzotzil or Tzeltal, a pair of closely related Mayance languages. The vast bulk of these Indians live in thirty-four rural municipios ranged around San Cristobal. Each has at least one cabecera which is the center of a community of highly ethnocentric Indians. Some municipios have more than one Indian community within or straggling across their boundaries. (Vogt, 1969a, Laughlin, 1969, Villa Rojas, 1969) due to misfits between the municipio, which is a Mexican administrative structure, and their actual community, which is an Indian social structure. All told there are maybe between forty and fifty Tzeltalan Indian groups. Each of these has a world view of its centrality in the scheme of things more or less as I have described and yet all of them exist together, and not only together, but in a constantly symbiotic relationship with the locally decentric world view of the Mexican. Altogether, boys, middle C. UMMMM

But if there is no way that they can sing together without becoming other than they are, there is a way to tell them all apart. And this is by their costume which is as integral to their world view as any other aspect of it but which can sort them out in a crowd, at a fiesta or a market. In his discussion of ethnocentrism among the Tzeltales of Tenejapa and Oxehue Carara says:

La existencia de una indumentaria especial y típica para cada Municipio individualiza a este lo separa de los demás. Las prendas de que se compone el vestido son las mismas en todos los Municipios Pero lo que los individualiza y distingue son la peculiaridades de adorno, colorido y formas de llevar dicha vestimenta. (Camara, 1966, 89).

Villa Rojas echoes this in speaking of the Tzeltal as a whole:

Each community has its own style of clothing, which gives a sense of unity to its members and permits the observer to identify easily the groups during fiestas or market days. This variety applies only to a few items of clothing, which is basically the same for the entire region;.. Each municipio has made of these clothes a typical outfit with special characteristics. (Villa Rojas, 1969, 208)

After warning us against "blanket statements about Tzotzil cultural elements" Laughlin says "Flaunting their unique costumes and customs in defiance of the pressures towards assimilation... the contemporary Tzotzil Indian still demonstrates a narrow allegiance to his community both by his dress and his participation in a set of beliefs and practices specific to that community" (Laughlin, 1969, 152). Speaking more narrowly of the Tzotzil Zinacantan Bogt says:

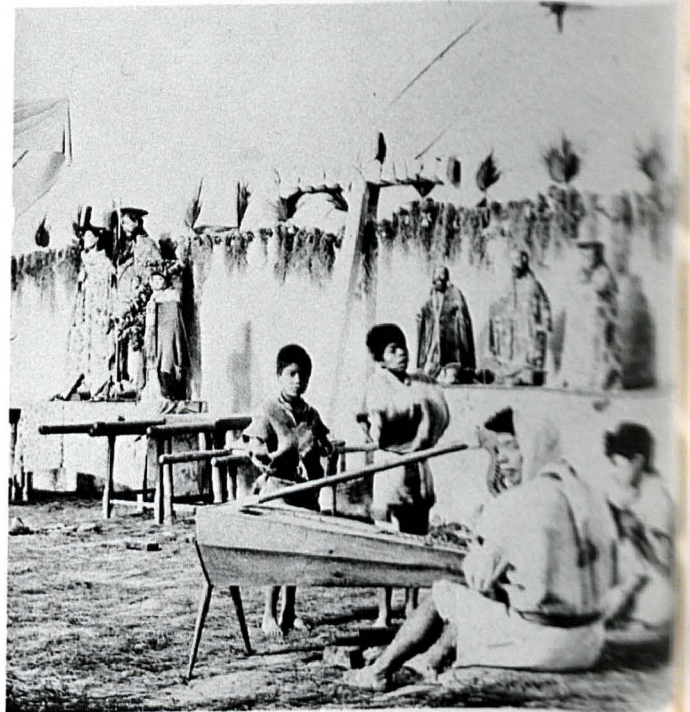
Zinacantecos are especially interested in clothes and appear to attach an extraordinary amount of social significance to them. Their styles readily indicate who is a Zinacanteco and Husiteco, or a Ladino. The rare marriages between Zinacantecos and people from other municipios always entail one a change of costume for one of the couple. The style of clothing differentiates between men and women and indicates who is a shamna or a cargoholder serving a specified ceremonial role. Since the population is relatively large, one person cannot personally know more than a fraction of his fellow Zinacantecos, but he can easily identify his role from the clothing that is worn.

There is strong emphasis upon having new and clean clothing--an emphasis expressed not only in the desire of both men and women to have new clothing for the important fiestas, but also in ritual sequences in curing ceremonies ... There is a strong strong belief that the ancestral gods will punish a person who goes about in dirty clothes.

Sacred objects as well as people have clothing in Zinacantan, and the emphasis upon new and clean clothing applies equally to them. The saint statues in the churches are clothed elaborately; their clothes must be washed and incensed periodically and new ones provided when the others become too old. (Vogt, 1969d, 107).

The costume is important. Because of its inherent drama and startling obviousness it may be the most important thing. Because I can hear Colby in the back of my mind saying "central, but not defining" I won't call it defining--not by itself--because no part of a culture is defining by itself. But the costume is more than central and it plays a role in Indian culture that is not simply diametrically opposed to the role it plays in Mexican culture but interconnected with and integrated into all the other cultural patterns in a way no Mexican culture could comprehend.

Take the single matter of the clothing on the saints. These saints are not your usual everyday Catholic saints. The Tzeltalans know nothing of dogmatic Roman hagiography and have made of the saints the Spaniards fobbed on them something of their own. They are gods and are so treated and are dressed, naturally, in the clothing typical of the community.





If man was created in God's image, in Zinacantan they are dressed in the gods' own clothes. Blom and LaFarge and others (Foster, 1960, for example) have gone so far as to suggest that the highly individualized costume of the Indian communities is to a certain extent actually modelled on the dress of the saints brought over by the Conquistadors. Blom says, for instance that the Huistenos:

...wore very small straw hats with streamers, stuck onto one side of their heads and tied on with a string. The explanation of this parody on Bridtsha sailors is that their patron San Martin at Huistan wears such a hat. (Blom and La Farge, 1927, 400).

Other parallels between colonial representations of saints and contemporary Indian costumes could also be drawn. On the other hand there are other connections that can be made. In this case between pre-Hispanic practice and the washing of the saints clothes. Cordry and Cordry say:

Chroniclers inform us that idols were dressed with great care in pre-Hispanic times, and that their garments were changed yearly at the time of their festivities. At the present time, in few conservative places, particularly in the Chiapas highlands, some saints are dressed in beautiful huipiles from the looms of the most skilled weavers instead of in conventional Biblical dress. These saints costumes are carefully washed at the time of the titular fiesta. The water is kept in large gourds, and after the washing the authorities of the village partake of it. When they have finished, they offer the sacred water to all the people to drink, (Cordry and Cordry, 1968, 12 but also see DUBY, 1961, 27-28 who described the situation firsthand. She was offered some of the water herself, but refused it: "El por ello que no conozco ni el sabor ni el beneficio del agua sagrada."

While there are many things going on here, they are revolving around the costume. The costume is sacred because it is the costume of the saints.⁴ The costume does not and cannot change because it is directly linked to the gods, who are not of the time of history. The wearing of the costume is thus in a sense a participation in the sempiternal order of the universe on a profound level. This is not a matter of passing a shop window and seeing an attractive shirt that jives with the color of your eyes or that goes with that second pair of pants that came with that nifty co-ordinated suit. This is not a matter of glad rags, duds, drapery, finery, trappings, turnouts, get-ups, rig-outs, lay-outs, or fofarrow. This is serious business: man and god, wed in life, through costume.

After establishing the connection between man and god, the costume distinguishes between those of one set of practices and another. The costumes cleave a distinction between

those whose primary allegiance is centered to put it simply around San Juan (Chamula) and San Pedro (Chenalho). San Andres (Larrainzar) and San Lorenzo (Zincantan), not that these foci occupy distinctive positions within the religious structure of a community, for they are all variant forms of some manifestation of a male godhead, but that this godhead pertains exclusively to the group whose costume identifies it as pertaining to that group. It is the nature of religious belief to know that life is possible only within the structure of such belief, and the Zinacantecan knows that he is of life and that others are in a sense scarcely of life at all. And the Chamula knows this. And the Huisteno. And each of the rest. And they declare this knowledge, this existence, through the costume, flaunting their unique centrality in the face of all others, particularly the Ladino and the Mexican, but also the other Indians,

This distinction made through the costume also creates and reinforces a sense of unity and identity within the group. We are the people, shouts the costume, and to those of the same costume it adds, you are one of us, while to those not wearing the costume it admonishes, you are not. Our Zinacantecan friends regularly encourage us to wear the costume when in Zinacantan: it identifies us as at least somewhat Zinacantecan. It includes us within the group. We cease being outsiders to the extent that we wear the costume, despite our faulty manners, despite our ten word vocabulary of Tzotzil. Once in costume, these can be dealt with, as though we were backward children with much to learn, but as though we were in a sense Zinacantecan children, members, belonging, given access through the costume to everything that attaches itself to the costume. It is a key with a power to open doors possessed by no other single aspect of the culture. Such is the power of identity of the costume.

As it enhances distinctions among highland groups, as it reinforces a sense of identity within a group, it also reduces distinctions within the group. The costume not only says, you are one of us, but, we are all alike. The age, quality, cleanliness of the costume may distinguish, but the form of the costume does not. Not on any permanent basis, at any rate. Distinctions in costume are made for those holding cargoes and those with the ability of shamen and between sexes. But no distinctions are possible through the costume in its form among age groups. Nor among classes. To this extent it reinforces the leveling effect caused by the cargo system, and allows the cycles of the years to find everyone dressed this year the way they were last. And it identifies those who step out of the endless turning temporarily, as those who take a cargo. We are all together Zinacanteca, the costume says, and altogether alike. The costume in its ahistoricity, its unchanging perennial fashionableness, also says that we are not only altogether alike now, but we have always

been alike then, and always will be tomorrow. So the costume establishes links of identity within the culture throughout time. The culture of the Indian is not merely an identity within the place of their dwelling, but throughout the time of their being.

Throughout the time of their being, within the place of their dwelling, and with the place of their dwelling, for the costume of the highland Indians is also tied to their mountains and their valleys. It not only declares that I am of a certain people, but that I live in a certain place, that place that is the center of the universe, that place harboring the navel of the world that place harboring the church of my gods, that place under the shadow of the mountain in which resides my other soul, that place, not just any place, but that place. Colby says "When Indians wearing regional costume move into another region they prefer not to wear the clothes of their indigenous region, yet at the same time refuse to wear the clothes of the new region; Ladino clothing is usually adopted" (Colby, 1966, 10). While this is a response to a variety of pressures, one of these is the connection between the place and the costume. My clothing only indicates my awareness of fashion and my idiosyncratic personality in my place in history of the world; the clothing of the Indian also says where he lives and what are the mountains he looks upon and what are the streams and springs whose water he drinks. When I look at the costume of an Indian I can say the name of his patron saint and how many miles he has to walk to home.

It is interesting, this distinction I so quickly draw between my clothes and their costume. It was not always thus. We too once wore a costume. It was customary, once, our clothing, as it still is among these Indians. When the Cordrys tried to investigate the meaning of the variations in costume among Indian groups they ran into a phrase again and again: "Es costumbre": it is the custom (Cordy and Cordry, 1968, 11). The similarity between the two words isn't accidental: custom, costume, they once meant the self same thing, and both words descend from the same Latin word, *consuescere*, which itself descends, tortuously, from the Indo-European root, *seu-* whose simple meaning disarmingly underwrites the complex meaning of the costume among the Indians of the highlands, "*seu-*, pronoun of the third person and reflexive (referring back to the subject of the sentence); further appearing in various forms referring to the social group as an entity, '(we our- selves'" (American Heritage Dictionary, 1969, 1538-1539). The *con* is a Latin intensifier meaning with, together, jointly from the Indo-European *kom-* meaning with. Thus custom means us, we ourselves, us the people, and costume little else. It is in this sense of costume that the Indians wear a costume, as a defining entity that says US, as opposed to our fashion which merely connotes something made. It is a simple matter to fashion an article of dress but

to costume a people is a matter of knowing who they are. And it is an easy matter to put aside an item of fashion, but to take off the costume is to give up the customs, the customs of the people. For an Indian to take off his costume is tantamount to leaving one world for another. The trauma of the European adoption of the Copernican universe at the end of the Middle Ages could have been no greater than that of an Indian putting aside his chamarra and cotton, his hat and sandals, and climbing into a pair of shoes, a button-down shirt and a jacket. Implicit in the costume is an ethnocentric and powerful world view rooted to a single place on the surface of the earth, and implicit to its denial is an entry into a relativistic universe without a center occupying historic time.

B. THE PATTERNS OF COSTUMES

Guiteras Holmes, writing of the women of San Pedro Chenalho, says:

Womanhood is made manifest in weaving: it is said in song that she weaves because she is a woman. A woman weaves her own clothes and those of husband and children, napkins carrying clothes, and other things. She cuts out and sews her children's clothes when the commercial muslin is used, mends and washes her own clothes and those of the younger children...

The Pedrano woman weaves cotton, not wool. She uses the backstrap loom. With the exception of a small number of specialist, weaving is a woman's only craft. (Guiteras-Holmes 1961, 51-52).

A woman weaves because she is a woman: woman and weaving, the two are defined on each other as the costume as of a group of Indians is defined on and by it, womanhood and weaving. Indianness and costume, nested pairs of meaning. Vogt says:

In the manufacture of wearing apparel there is a clear-cut division of labor by sex, with the bulk of the work being done by women. The Zinacanteco men make palm hats and dye and arrange yarn for the tassels on their chamarras; they also make, paint and generally maintain the special masks, head-gear, and other items of costuming needed in the large fiestas. Otherwise clothing in Zinacantan is women's work from beginning to end--from owning, herding, and shearing sheep to washing the clothing when it is soiled, (Vogt, 1969d, 101)

Speaking broadly of the Tzotzil as a whole, Laughlin says:

Spinning and weaving are women's work. Men generally tailor and sew their own clothes when the material is factory-

made. Men weave and sew palm hats. A man launders his own clothing in Chamula and Chenalho, but in other towns this is considered a ridiculous reversal of responsibility (Huitan, Huitiupan, Pantelho, V. Carranza, Zinacantan). Laughlin, 1969, 164.

Villa Rojas says of the Tzeltal:

Laundry and all kitchen duties are performed by women, as well as spinning, knitting, sewing, embroidering, and making of earthenware. Manufacture of palm articles (sleeping mats and hats) as well as articles of wood, stone or leather are tasks for men; the same applies to basketry but women may occasionally help. (Villa Rojas, 1969, 209-210)

And so it is women who make the clothes, and who are not only identified by the costume they wear but partially defined by the fact that they make it, weaving because they are women, women because they weave. And the weaving...that's just part of it.

Vogt hints at the larger picture when he says that it is women who also own, herd and shear the sheep, yes, and comb the wool and spin the thread and set up the warp and weave and cut and sew and embroider too, the whole of the operation an integral part of the very fabric of the life of the community, and each of its parts wholly integrated into the larger operation. It has been described many times (by Blom and La Farge, 1927, 346-349, et passim, Vogt, 1969d, 101-107, in the highlands of Chiapas; O'Neale, 1945, 1-84, et passim, among the Maya of the Guatemalan highlands, Cordry and Cordry, 1940, among the Aztec, and 1941, among the Zoque of Chiapas, and 1968, 25-42, among Mexican Indians generally; and so on) and at length, and unless you know nothing about, it isn't very novel. But it is important because without an understanding of the thunk, thump of the batten being pulled back hard against the last woof thread and the slight release of tension of the backstrap and the fast-following thump, thump as it catches in the small of the back, again and again, following the bobbin, thunk, thunk, thump, thump, slowly thread by painful thread, being rolled up and then coming again, thunk, thunk, thump, ---because without an understanding of this making of the cloth there is no understanding whatsoever of the costume and its role in the life of the women and their role in the life of the community and no understanding at all of what it is that makes those patterns possible.

Among the weavers of wool (see Figure 1 for these) the process is more elaborate and more time consuming than among the weavers of cotton only, for cotton is not raised in the highlands and its weaving begins with the purchase of thread instead of the purchase of sheep. Sheep are commonly raised

by the women of Chamula, Huistan, Larrainzar, Pantelho and Zinacantan, and occasionally by women of other highland communities. They are grazed commonly throughout the territory. This work is carried out by the women with the help of the younger children, including small boys. It is common to see a woman with her loom attached to a tree weaving while watching her animals. Even in the communities where sheep are raised they are not universally raised and many women purchase fleece from those with sheep. The animals are sheered at least three times a year and the fleece is washed and either left white or dyed. In Chamula the dark wool is often not dyed and this results in a brown wool as the melanin fades, but this is the only community for which this is true. Rarely it is dyed red, and even more rarely other colors, with commercial dye purchased in San Cristobal. Ordinarily the wool that is not black, white, gray (usually found only among the Chamula) or brown is purchased as yarn in San Cristobal. The wool is carded with steel combs purchased in San Cristobal and spun on spindles often purchased from specialist manufacturers (as those in Larrainzar) but frequently made at home. Generally it is a foot or so in length with a flywheel consisting of a hard clay whorl. The weighted end of the spindle is set in a gourd bowl and the upper end is held against the thigh, the left hand spinning, the right drawing out the thread. Many women own and use a winding frame for both the wool and the purchased cotton. If not, the thread is wound directly onto a warping frame. Warping boards are unknown in the highlands.

The warping frame consists of a notched stick four or five feet in length. A cross-stick is inserted at the notch corresponding to the desired length of the fabric and once a sufficient number of warp threads have been wound the web is transferred directly to the head-and foot-sticks of the loom. With the possible exception of the warping, all these activities are carried out on an as-there-is-time basis as work for women in the home but unable to help with the cooking (because cooking can occupy only so many) and so on. The warping is generally a serious business awarded the status of a task for which time must be made. The ease of weaving and the quality of the cloth is often determined by the character of the warping. In some highland communities the cotton is starched and transferred directly onto the loom sticks wet, then combed, as this facilitates weaving (Zinacantan, Magdelenas, Tenejapa, V. Carranza, and likely others as well).

The loom almost universally used is the pre-Hispanic back-strap loom. Laughlin (1969, 161) says "Weaving on the back-strap loom is universally practiced by the women of the highland towns, and V. Carranza, though this craft has practically disappeared in Huitiupan," and Villa Rojas says (1969, 207)



"Another widespread craft is spinning and weaving of fabrics for clothing. No village in the Tzeltal area trades these products because production barely meets their family needs. The backstrap loom of pre-Hispanic origin is the chief tool." The backstrap loom has no rigid frame, tension being provided the warp by the weaver's back. The loom consists of nothing but a bunch of sticks and only exists as a loom while a fabric is being woven. O'Neale provides one of the best descriptions of the backstrap loom and while she is speaking of the Maya of highland Guatemala in all essentials she might as well be describing the looms of the Chiapas highlands (compare Vogt, 1969d, 104-105 and Blom and La Farge, 1927, 346-349). She says:

The number of sticks required by the weaver varies according to the type of decoration she plans to work into her fabric. The most common parts of the stick loom are here listed in order of their position beginning at the working end: (1) the backstrap or broad belt and the cords extending from its ends to (2) the end bar, close to this last (3) a second smaller bar which lies loose on the web, then (4) the tenter, (5) the bobbin, (6) the batten or sword (espada), (7) the heddle or heald, (8) the shed roll or shed stick, (9) one or several lease sticks and (10) the second end bar. (1945, 31)

This second end, or foot-stick, is fastened to a tree, housepost or other stationary support. Between the two end bars stretches the warp. As the weaver leans back against the backstrap, pressure is applied to the warp which becomes taut, the shed roll creates a triangular shed, and the bobbin or shuttle is sent across the warp threads carrying a weft thread. Ordinarily the batten

...is inserted and then placed on edge in every space made through the warps for the passage of the bobbin thread in order to keep the space clear; it is turned down on its side and brought forward for or less vigorously after every passage of the weft yarn; and then it is withdrawn. These several motions are made before and after every cross yarn in the plainest woven fabric and in the elaborated fabrics the sword is manipulated even more times. (O'Neale, 33)

As the sword is brought more or less vigorously forward, toward the weaver, the pressure is reduced on the backstrap which snaps away from the weaver's back, however briefly and then once again picks up the slack by slapping up against the back once again. The finer the fabric the more vigorously is the sword pulled toward the weaver and the more fatiguing the backstrap. Good weavers maintain a constant pressure on the loom at no little cost to their spine (which is to suggest nothing about the fatiguing character of the treadle loom). In order to reduce this problem most weaving is done

at a slant with the weaver leaning back comfortably against the backstrap as if in a bucket seat. In this way tension is partially maintained by sheer body weight.

As weaving progresses it is necessary to roll up the fabric in order to keep the working edge within the reach of the weaver. In this rolling process the smaller loose stick mentioned by O'Neale (her third stick) plays a part, for it in conjunction with the end bar creates a "Bolt" around which the cloth may be conveniently rolled. Every loom I have examined in the Chiapas highlands employs such a bolt-stick. Likewise most looms also have a tenter (or edgeholder as Vogt terms it) although I have seen weavers work without it and many fabrics where it was obviously not employed (as evidenced by the wild lack of uniformity of width of the fabric). Similarly most women use lease sticks at the foot-end of the loom to maintain the order of the warp threads. Two of the looms in my collection use two lease sticks and another uses heavy yarn instead. These are invariably placed just behind the main shed roll.

For plain fabric only one heddle is used in conjunction with the shed roll, but for the more elaborate patterns brocaded by the women of Magdalenas, Larrainzar, Mitontic, Chenalho, V. Conranzo and Tenejapa a number of other warp-lifters are added. Much brocading is accomplished with the use of thin brocading swords, but the use of additional warp-lifters is also common, and they are regularly a part of the loom in Carranza. Vogt says that "All Zinacanteco weaving is done with only two sheds" (1969d, 104) but this is true only most of the time, and regularly untrue in other communities. Even in Zinacantan some weaving is done, particularly of servilletas, with as many as four sheds. (The loom illustrated by Blom and La Farge, 1927, 348, includes two shed rolls, although the one nearest the foot may actually be a lease stick.)

Ordinarily an inch or two of fabric is woven at the foot-end, the loom reversed and the rest of the fabric woven toward these couple of inches. As the closes the space lifted by the shed becomes smaller and smaller and the tension greater and greater. Smaller sticks are inserted near the very end and the last inch or so may be woven using needles instead of the bobbin. This portion of the fabric is never as tightly woven as the rest and shows on most finished products as a band of loosely woven material run through tighter material on either side. On huipils it generally hangs in the back where it will be least readily seen and is often obscured on sashes by a variety of needle-worked brocade. When the fabric is completed the heddle and other warp-lifters are cut off, the end sticks are removed and the textile is completed. And the loom returns to its condition of a handful of sticks.

Once the loom has been set up it can be moved around with ease by slipping off the backstrap and taking the foot-end from its pole, tree or what have you. Rolled up it is extremely por-

WEAVING PRACTICES IN HIGHLAND INDIAN COMMUNITIES

	Do not weave	Use Backstrap Loom	Weave wool	Weave cotton	Weave both	Finger weave wool	Embroider cotton or wool	Embroider with silk	Raise sheep	Men weave hats
Tzotzil										
El Bosque				1						
Chalchihuitan		1								
Chamula		1					2		1	
Chenalho		1	1	1		1				
San Felipe					1	1				1
Huistan		1		1	1	1	2		1	
Huitiupan	1		1							
Ixtapa										
Jitolo										
Larrainzar		1		1		1			1	
Magdalenas		1		1		1				
Mitontic		1		1		2				
Pantelho		1		1		1			1	
Santa Marta		1		1		2				
Santiago		1		1						
Simojovel			1	1	1	2				
V. Carranza		1	1	1	1	1	2		1	1
Zinacantan										
Tzeltal										
Aguacatenango	4								4	
Altamirano										
Amatenango	4								4	
Bachajon	3									
Cancuc		3		3		2				
Chanal										
Chilon										
Ocosingo		3		3						
Oxchuc		5		5		2				
Petalcingo										
Sivaca		3		3						
Tenango		3		3						
Tenejapa		5		5		5				
Villa las Rosas		5		5						
Yajalon		6		6		6		6		

All of the communities included have Tzotzil or Tzeltal speaking components in excess of 50% of the population of V. Carranza, which falls just under the line. Sources: 1, Laughlin, 1969, 160-161; 2, personal observation in the field; 3, Blom and La Farge, 1927, 333-387; 4, Nash 1970, 61-63; 5, Camara, 1966, 89-90; 6, Starr, 1908, 380. The blank indicates only a lack of attribution of the trait, not necessarily its absence.

table and can be set up in a matter of two or three minutes, out in the fields watching the grazing sheep, or back home on the terrace outside or even within. Weaving is thus also a time-filler though weaving activity peaks prior to the important festivals of the various Indian communities when new clean clothing has special social status.

The clothing produced is rarely cut, having been woven to size. For basic articles of dress the pieces are simply stitched together. Depending on the garment a neck hole may be cut. Finally the woman may further embellish the garment with embroidery in cotton, wool or silk. In this work modern steel needles are generally used. Silk is employed in the south of the region (in Amatenango, Aquacatenango and V. Carranza where it is obtained in trade mostly from Guatemala) except for an instance reported at Yajalon in the north by Starr in 1908 (which might also have reached Yajalon from Guatemala via Comitán). Much more embroidery than is indicated on Figure 1 probably takes place, but it is relatively common where indicated, on servilletas, headcloths, and along the edges of chamarras, cotons and other garments, except in Huistán where it comprises the bulk of the surface decoration.

There are clearly exceptions to this general pattern. Women do not weave at all in Amatenango, Aquacatenango (Nash, 1970, 61-63), little in Huitiupan (Laughlin, 1969, 160) and Bachajón (Blom and La Farge, 1927, 349), and, with the exceptions of V. Carranza, less in the lower areas of the region than in the higher. Those that do not weave buy commercial cloth woven in San Cristóbal, Comitán or V. Carranza, generally cotton, or woolen garments, generally from Huehuetenango in Guatemala. But even in these cases the women embroider the fabrics to create the distinctive costume that defines their existence as Indians. Other tasks fill the place left by weaving in the lives of women from these communities, as, for instance, pottery in Amatenango which is traded widely throughout the entire central part of the state of Chiapas and even in Guatemala. Other sources of clothing for those that do not make them include Chamula which is a major producer of woolen garments for the region for a number of Indian communities, Magdalenas which does weaving for San Pablo, Chalchihuitán, and so on. The full complexity of this clothing trade needs to be much more clearly understood. All Indians from all communities utilize store bought cloth regularly, often as an undergarment, or skirt.

All of this weaving produces few basically different garments. As Villa Rojas (1969, 208) and Camara (1966, 89) pointed out above, the variations among the costumes of the Indians are worked on very few themes. Cordry and Cordry say it is worked on just one really:

It is difficult to discover how much present-day Indian costume was influenced by Spanish costume, and how much of

it was native to Mexico before the conquerors arrived. Curiously enough, many garments in use in Mexico before 1519 were also used in Spain. This fact has produced a great deal of confusion in terminology. All the poncho-type (jorongos, coton, sarape, and so forth) are often said to be Spanish, but if we assume that the same items of dress were used in Mexico that were used in Peru-- and Mexican pre-Hispanic figurines support this assumption- we will conclude that these same garments were used before the arrival of the Spaniards, but called by other names. All are really huipil-like garments, some longer, some shorter, as the case may be. (Cordry and Cordry, 1968, 10)

And with the exception of skirts, pants, sashes, bags and hats the larger part of the Indian costume of the highlands is also a set of variations on the huipil, essentially a length of cloth, rectangular in shape, with or without a neckhole, with or without sleeves, stitched up the sides or not hanging to the ankles or just below the waist, and so on. In the highlands this garment appears in three fundamental forms, with sleeves and to the knees as a male or female garment, with or without sleeves to the waist as a blouse for women or with sleeves and a shirt for men, and unstitched and between waist and knee length as an over-poncho for men.

The items out of which the costume is organized are summarized below for regular wear:

	Men	Women
Head	Hat Kerchief	Headcloth
Shoulders	Neckerchief	Cape, shawl Carrying cloth Rebozo
Chest	Shirt	Huipil, blouse
Trunk	Tunic, long shirt	Long huipil
Overgarment	Coton, poncho chammarra Sarape	---
Waist	Belt, sash	Belt, sash
Legs	Pants, shorts	Skirt
Feet	Sandals	---

Some of these items are mutually exclusive, others redundant. For example, those Indians who wear a long shirt or a tunic do not also wear a shirt; similarly those who wear a long huipil do not wear a shorter huipil, or blouse, or skirt. When a belt is worn (a strip of chamois or a leather belt with metal buckle among the men, a heavy woven wool strip among the women) a sash is not (this being of woven cotton, usually with decorated ends or fringe). A woman wearing a cape (a small shawl) or shawl does not wear a rebozo (which will include in our discussion shawl-like garments imported from outside the region, as the rebozo of Amatenango) although she might wear two capes or shawls and a carrying cloth (in which she might sling her baby). Headcloths and capes are often the same item, as is sometimes true among the men (as in Zinacantan) where the kerchief is worn around the head in the cool of the morning, around the shoulders during the day.

A man might thus wear a shirt and pants or tunic under a belted cotton, a neckerchief, hat and sandals. In the cold weather he might also carry a sarape. When it rains he either adds a rubber rain poncho (bought in town) or wrap himself in a piece of colored plastic fabric (also bought in town). A woman typically wears a huipil and skirt held in place with a belt, a cape or shawl, and sometimes a headcloth. She may or may not use a carrying cloth depending. She seldom wears anything on her feet. In cold weather she may add an additional cape, or one of heavier make, switch from a cotton skirt to one of wool, or otherwise modify her outfit. She will not add a new type of garment, however. In the rain she might carry a sheet of colored plastic wrapped about her. Both men and women frequently use bags, woven of pita, cotton, sisal or wool, as carry-alls, men may add leather purses, and both employ tortilla bags and servilletas (napkins essentially) for a variety of purposes.

To a certain extent, each community can be distinguished by observing the combinations of elements employed and their shapes, without reference to the surface decoration. The men of Sivaca, Bachajon, Yajalon, Oxchuc, Cancuc and other Tzeltal of the north are seldom seen wearing a cotton, wear a simple long tunic with a sash and little else. The women simply a long huipil, ordinarily without any other garment (sometimes a cape). These can be immediately distinguished from the rest of the Tzeltal and all the Tzotzil. The mere shape of the hat will tell a Chamula from a Zinacantecan from a Huisteno. But there are serious limits to this morphological identification. In the end it boils down to the nature of the surface decoration, as it does with us.

The costume of the Chiapas highlands acquires its joie de vie, its puzazz, its elan, its ability to charm and bewilder and bewitch with its magic. For these decorations are rich and various, yet contained by a communal pattern,

engaged in a balancing act between we and us that utterly commands stage front and center.

C. THE PATTERNS ON COSTUMES

Someone has written that the highlands of Chiapas are like the hills around Kyoto or the mountain country of the Austrian Tyrol. I don't know about Kyoto, but whoever it was had a point when it came to the Tyrol. It is the green mountains, I think, that do it, and the small towns and little hotels and a certain comradeship in their lobbies with the playing of guitars into the night. And a lot of other things I guess. But the highlands of Chiapas are not the Alps, because they're not and because you can't divorce the scenery from the people that make it. It's a union made in a heaven we don't even think about and no man can break it. The highlands of Chiapas are characterized best by its people, not completely, but best, and they are best characterized in a thumbnail sort of way by their clothing, fashionable or traditional or transitional clothing--the Indians--are spread across the mountains and are best characterized by their costume. Each community is characterized by the nature and mix of garments and the garments are characterized by their size and shape and surface, and the surface is characterized by the color of the threads and the way they break the surface into regular sets of shapes and sizes of color. In the end the patterns of the highlands, nested forever, come to this: colored threads lifted for a moment above the warp and then gone. And in these colored threads lies the difference that means we are in the highlands of Chiapas and not in the Austrian Alps.

Bits of colored yarn. A woman in San Andres Chamula, also called Larrainzar, sits cradled in her backstrap loom, weaving. Her web is fourteen inches wide and forty inches long and half that distance has been rolled in front of her, completed. She is brocading a large area in broken lozenges of dark blue against a field of red. If we watch closely we see that the field of red is actually made up of large numbers of smaller red lozenges. When she finishes this web she takes it off the loom. She has already completed two other webs, each a foot wide and forty inches long. She sews these on either side of the wider web. She folds it in half and puts her head through the neck-hole. Twenty inches of brocaded cloth fall in front and twenty inches fall behind. Her huipil is nearly complete. She slips it off and sews up the outer sides leaving small arm holes. Voila! It is done. From a long way off or in a crowd at market anyone can say of her that she comes from San Andres and know where that is and other things. Oh, and also that she can really weave. Boy can she ever weave.

When you first look at the huipil you are dazzled by the red and blue, and mostly by the red. Women from San Andres

wear red huipiles, you might say, and add, with blue diamonds as an afterthought. It's sort of like going to San Cristobal and saying that there are Indians there, and adding, and boy do they ever dress crazy, as an afterthought. It's not that simple. The decoration of the huipil is worked in horizontal bands of various widths. There are twelve of these bands involved in the huipil and each of them is distinctly composed of a number of motifs. Their discovery is as illuminating as the realization of the fact of the individual Indian communities.

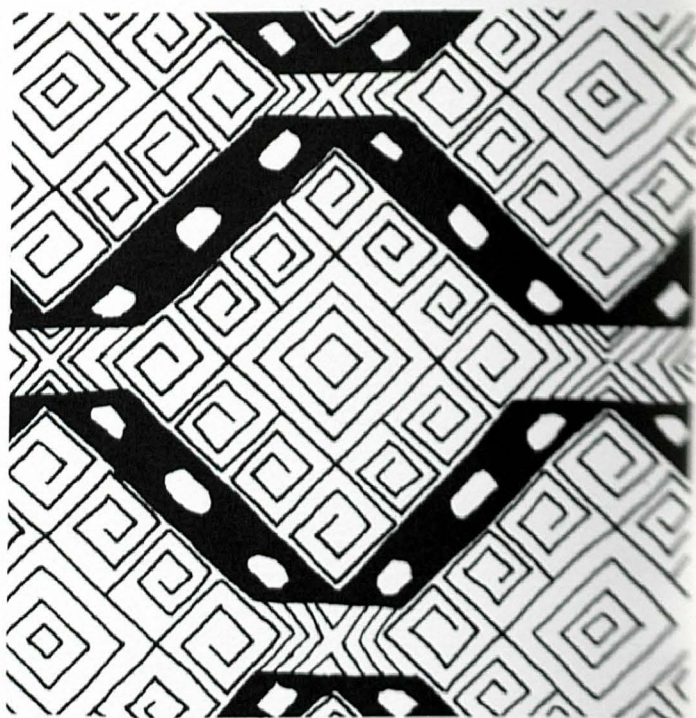
The most important band is the large central one, the one with broken blue lozenges on a field of red. This is Band L1. As you can see it consists of a red diamond or lozenge surrounded by twelve smaller lozenges. These thirteen lozenges themselves form a larger lozenge. About six of these lozenges march across the width of the central web of our huipil, their wide-dimension points barely touching. About nine of these bands of larger lozenges cover the front and back of the central web of the huipil. They are separated by outlining in deep blue about the thickness of the smallest lozenge. As can be seen, the blue outline actually consists of tiny lozenges of blue and red inside a fine blue edge. Finally there are flecks of other color floating in the red, bits of pink and orange and green and blue. Many of these are V-shaped and form the tips of the smaller lozenges.

Fore and aft of this major band is a smaller one, Band L2. It consists of a field of small lozenges that completely fill the space of the band. Alternate rows of the band are colored and these slant from upper left to lower right. There is a row of orange, then of red, then of green, then of red, then of pink, then of red and so on repeating this scheme across the width of the fabric. The two bands, L1 and L2, fade into each other without interruption.

Band L3 runs vertically along the neck hole. It consists of colored chevrons, a pair of red, then of green, then of red, then of orange, then of red, then of pink. This is one of many edging bands used in the highlands.

Band L4 is a transitional band, a term I use to describe a motif used to move from one major thematic band to another. It may be run horizontally or vertically. Here it is nothing but a running line of v-shapes in red, with blue outriders that echo the blue outlining of L1. The most common transitory band is termed Lg on this huipil. It is nothing but L4 without the blue, a zig-zag line of v-shapes. It appears in two forms of this and many other huipils. It may be woven as it is when it is part of the decoration, or appear as the stitching that binds the webs of the huipil together. It appears in both forms on this huipil. It may be of almost any size.

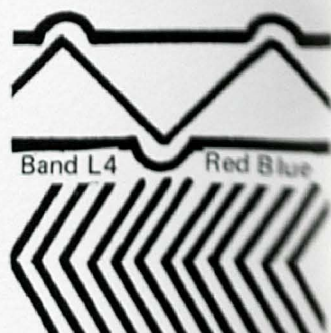
Band L5, L6, and L7 are seemingly a little more anthropomorphic in character. The core motif is still the lozenge, but they are now floating in space with what could pass for feet



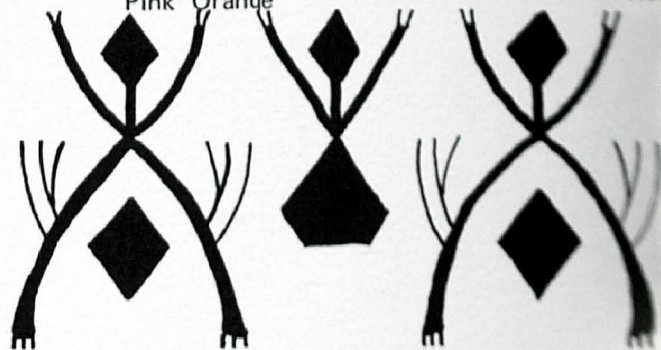
Band L1 Red Blue



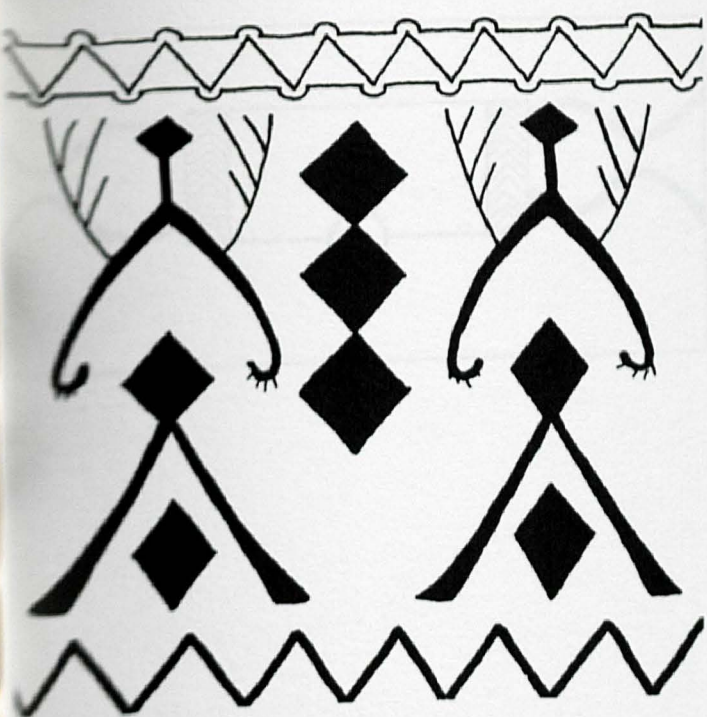
Band L-2 Red Pink Green Orange



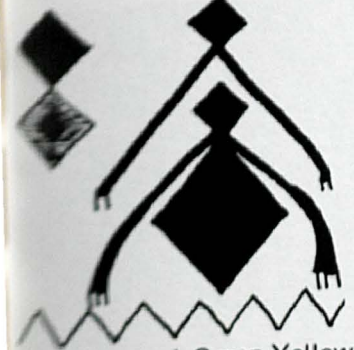
Band L3 Orange Green Red



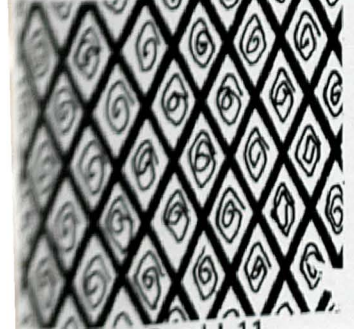
Band L-6 Yellow Red Green



Band L-5 Red Blue



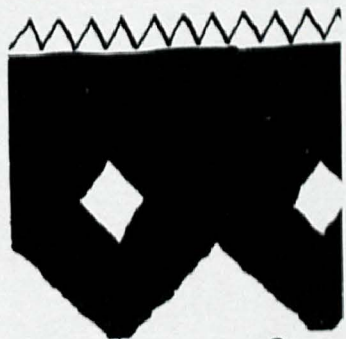
Band L-7 Red Green Yellow



L10 Band L11 Yellow Green Red



Band L8 Yellow Red



Band L12 Red Green Pink Orange

and hands or wings. I shall not refrain from guessing what they might be. In L5 the figures could be men, with the central lozenge as the abdomen, the upper lozenge as a head. The "branches" could be arms and hands, the "wishbones" a further articulation of the abdomen and the obvious legs and feet. If this is a man, it is not the conventional representation that one finds on the costumes of neighboring communities, and and so it could represent a spirit or nothing at all--a mere convention--although this is hard to swallow. Band L6 would seem at first to confirm the "people" character of the figures in L5 except that the "spurs" erupting from the figures "knees" are not obvious. They may, however, be purely conventional. Band L7 does nothing to clarify the problem. Here some of the humanoid elements have been inverted. The resultant figure could as easily pass for a variant of a common rain symbol. The genesis of these bands is unknown. Perhaps L5 and L6 were created by the inversion of elements of L7 instead of the other way around, although judging from the size and positioning of the bands on the huipil, L5 is the most significant of the bunch. All three of these bands are related and could readily have been designated L5A, L5B, L5C and so on.

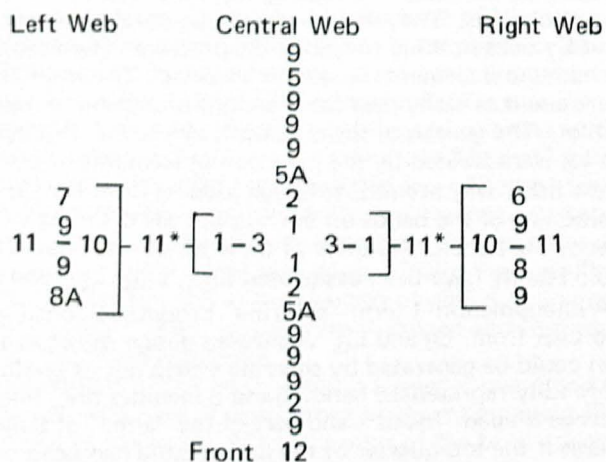
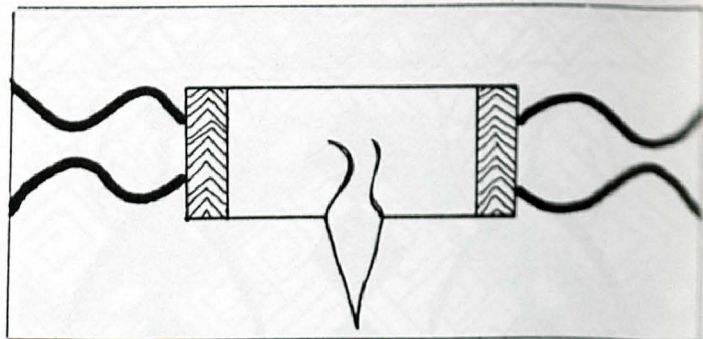
A phenomenon I term "sheering" produces Bands L8, L8A, and L5A from L5 and L6. A sheered design shows as a band that could be generated by sheering a strip out of another more fully represented band. Band 8 includes the "fingers", lozenge-shaped "heads", and part of the "arms" of Band L6. It is as if the top quarter of the parent band had been sheered off and used as a band in its own right. Often a phase in the coloring is also involved in sheering. L8A includes a phase shift in color but is otherwise L8. L5A is a sheered and re-phased color version of L5. (Neither of these are illustrated.)

Bands L10 and L11 are distinctive variants of L2. The field consists of the small space-filling red lozenges. In Band L10 alternate rows employ red, orange and pink to set off the upper tip of the lozenges of alternate lozenges. That is, in a row slanting from lower left to upper right we find a lozenge in red, then one with the tip outlined in green, then a red one, then a red one, then one with pink, and so on. These rows with the non-red colors alternate with rows of lozenges in pure red. In L2 the strongest effect is that of slantwise bands in non-red colors. In L10 the strongest effect is that of a red field with chevrons of non-red floating in it. In L11 the effect is still other since here the vertical character of the design has been accentuated by outlining a lozenge in dark blue, and continuing the outlining to partially outline the lozenge directly above and below. This L11 is run as a vertical strip, three lozenges wide, on the right and left of L1.

Finally there is Band L12 terminating the front of the huipil's central web. It consists of a row of red lozenges bled together at the top creating a simple red field. In the center

of these lozenges the bare white cotton web shows through as a white lozenge. The lower portion of the red lozenges have been picked out in orange, pink and green.

The huipil has a square-cut neck-hole with a slit toward the front to increase its effective size and is provided with tie-strings to close it tight around the neck. This enhances its effect as an elaborate and beautiful combination breast-plate and necklace. The relations of the bands to each other are shown below:



Huipil from San Andres Larraínzar. (Catalogue No. 51.002)

*This is Band 11 run vertically three lozenges wide.

NB: The webs are stitched together with red thread their entire lengths. Brackets indicate that the band number to which they point is as long as the material covered by the designs they include. i.e., Band 11 runs the length of Band 1, and the designs on the outer bands are the same length.

As may be seen, the bands are essentially symmetrically arranged around the neck. The two are not identities, which means that the huipil is symmetric front to back and left to right independently. There are also symmetries within each major axis. For example, 11-10-11 are symmetric around Band 10, but only in terms of design, and 9-5-9 and 9-2-9 are symmetric around 2 and 5. On some huipiles these sub-axial symmetries are numerous and amazing.

Consider, for example, this huipil from Magdelenas. I have indicated the symmetries with the brackets on the right web only in the vertical dimension and across the bottom in the horizontal. While the nature of the bands are presented below, it is important to note that Magdelenas Band 5 equivalent to San Andres Larraínzar Band 9, that is, a simple zig-zag line.

In this case, however, it is a bold and highly resplendent version to which we are treated, entirely obvious in photographs and very much a design element. It is also, as must be clear from reference to the figure, the most commonly occurring distinct design element. As reference to the symmetry brackets will show, there are no less than thirteen subaxial symmetries and one axial symmetry on the right hand web, duplicated on the left hand web. There are additionally another seven in the central web (ignoring for the moment the difference between Bands M7 and M5) and twenty-two horizontal subaxial and axial symmetries (ignoring the sub-band variations denoted by the letter postscripts). This means that there are fifty-seven symmetry relations on this huipil, organized hierarchically from the simplest 5-band-5 component to the most complex axial Symmetries. I can think of no article of Western fashionable attire with a symmetric complexity and richness even beginning to approach this. Nor have we done, for within each of the design elements of the bands there are yet finer-grained symmetries to be observed.

Band M-6 Pink Blue Orange

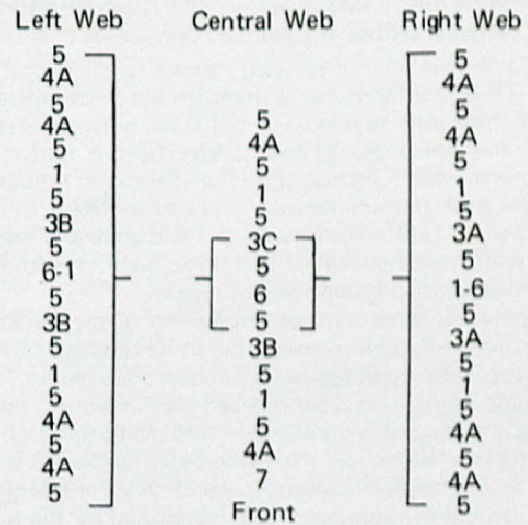
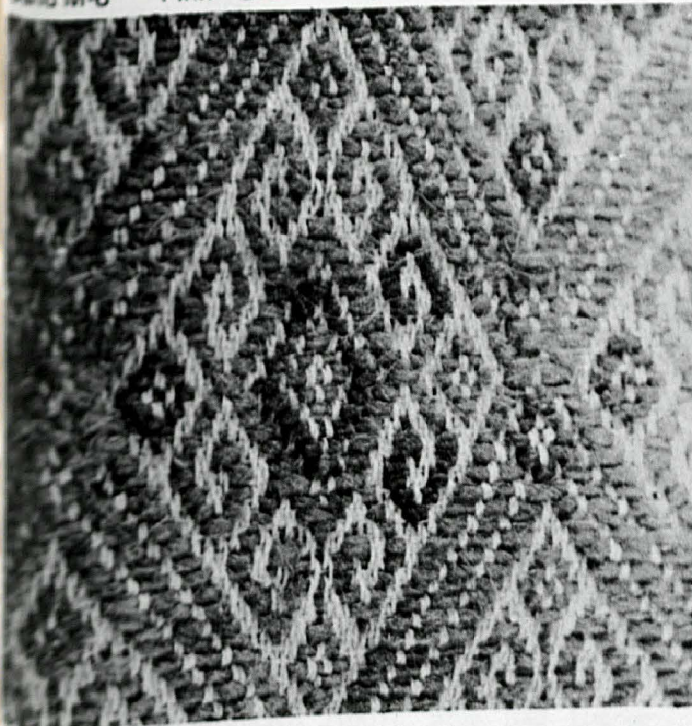


Figure- Huipil from Magdelenas. Catalogue No. 54.002 NB: The webs are stitched together with white thread and it is not a design element in this huipil. The heavy brackets represent the co-linearity of the designs, while the fine brackets on the right web and across the bottom pick out symmetries inherent in the pattern.

Band M6 covers the largest area on the huipil and is centrally arranged around the neck hole, in the breastplate manner typical of San Andres Larrainzaar. It is clearly the dominant design element on this huipil. It consists of a set of

nested lozenges, mirror symmetric around both the vertical and horizontal axes. This, of course, is in the nature of lozenges. However, as we move out from the center we discover that the arrangement of the frets (or greca, as they are called in Mexico) adheres to this same symmetry. This need not have been so. They might, for example, have filed around the perimeter of the interior lozenge with their mouth all pointing in the same direction. Thus, considered as a whole, this motif is mirror symmetric around both major axes. (Note that these axes may not, however, be interchanged). Finally I would draw your attention to the symmetry of the interlocks where the central Band M₆ motifs join together to create the larger band pattern. Here also we find an identical symmetry. Thus in this single motif we find nested symmetries (the lozenge) and asymmetrical (the greca) shapes. But these endless symmetries induce no monotony in the observer, for even as he takes them in, he finds them consistently violated by asymmetric but regular and complex variations which breathe incredible tension into the larger image of the band. Further, while the design kernels are symmetric, the matrix which they imply is not, in that it can be alternately read as diagonal stripes, horizontal rows, or vertical columns, none of which is symmetric with respect to the huipil as a whole. Thus in attempting to organize the pattern the observer is constantly tossed back and forth between alternative views of the same material confounded by the underlying but slippery symmetry, intrigued by the chromatic brilliance (identical both terminologically and substantively to the use of dissonance in 19th century music) and generally stimulated by the endless fascination of this single band on a huipil with seven different bands and two subtypes!

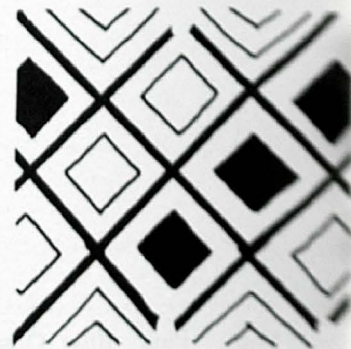
This amazing game is played elsewhere. Consider the variations rung on Band M₃, consisting in its simplest form of a row of lozenges separated nests of chevrons vaguely resembling pom-poms (M_{3A}). This band is symmetric around the horizontal axis, and around any axis drawn vertically through either a pom-pom or a lozenge. This symmetry applies to the color as well as the form. However, in Bands M_{3B} and M_{3C} this simple symmetry disappears, and is replaced by the more complex relationships seen in Band M₆. Here the coloring of the bands strongly reinforces the diagonal stripe interpretation, and the conflict between this and the horizontal row or vertical column is not so great within each band. However inasmuch as all three bands are intervisible on the huipil, the conflict is actually enhanced, as it is by comparison with Band 6 and Band M₁ (a simple field of lozenges arranged in colored diagonal stripes and highly similar to Bands L₁₀ and L₁₁ from San Andres, of which it is the simplest variant.) Further, the fact that all three M₃ variants (A,B,C) are used together on this huipil indicates that these considerations (the tensions induced by the variant perceptual interpretations of the or-

Band M-3C

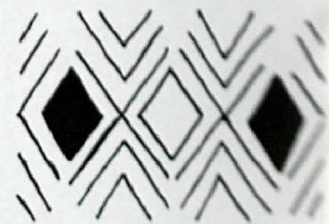
Black
Yellow



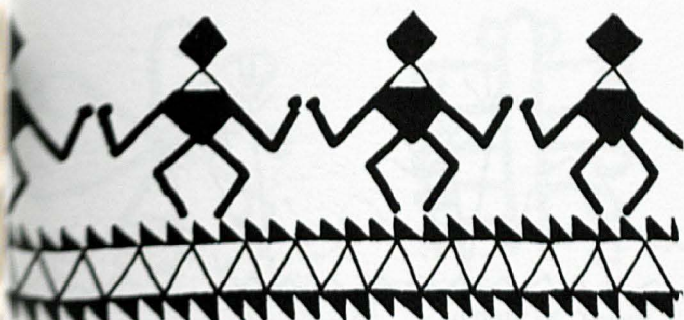
Band M-3B



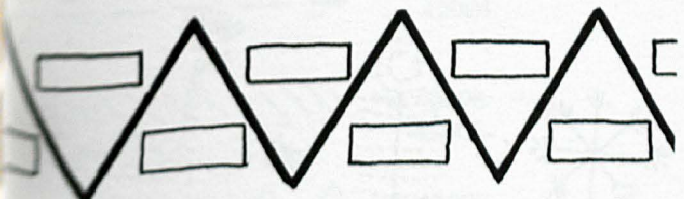
Band M-3A



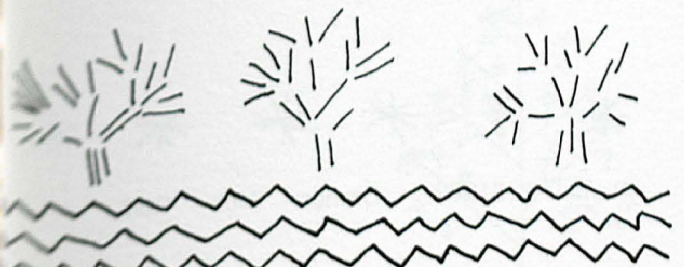
M4A Yellow Pink Green



M5 Blue Red



Band M7 Orange



Band C 1 (Catalogue No. 21007) Blue Red Orange

ganizations of the design motifs, the chromaticism, the battle between symmetric and asymmetric elements) are part of the conscious intention of the weaver and firmly under her control, within the limits set by the demands of traditional and intergroup recognizability (which point could be better made by comparisons among many huipiles, but which is beyond the scope of this introductory essay.

The reference for all these patterns is Band M₅, the simple zig-zag line (seen below under Band M_{4A}). The larger bands can all be generated by this band and its horizontal reflection and many of the smaller parts of bands (such as the pom-poms) can be generated by nesting the simple chevron which forms the nucleus of Band M₅. Thus M₅ is more than a simple transitive device allowing us to move from band to band without shock; it is a referent to which all are referred, and its constant repetition is like a resetting of the most fundamental design element on the huipil, from which we leap to more and more elaborate variations as we approach the central neckhole and the resplendence of M₆, always coming back to M₅ before going on, as if to remind us, and the weaver herself, of the incredible nature of this exercise of generation and perception making and seeing. Band M_{4A} shows this off to an unusual extent. This consists of a row of people-like figures constructed of lozenges and chevrons, the chevron itself plucked from Band M₅. These figures, of unusually complex chromaticism, form Band M₅ itself when arranged so that their hands nearly touch. Band M_{4A} seems to be a sort of summa of the potentials inherent in the simplest nuclear element on the huipil, demonstrating its use in mimetic forms. Band M₇ completes the catalogue of bands for this huipil and is clearly a variation on M₅. It occurs only on the front of the huipil where M₅ is on the back, and is presented in the same color as that one. It would seem reasonable to suggest that the variation, which spoils the vertical axial symmetry of the central web, exists simply to completely distinguish the front of the huipil from the back.⁵ It was, incidentally, the first design to be brocaded on the central web, which equally incidentally, gives me the opportunity to point out that as the web is rolled up in front of the weaver, it is nearly irretrievable until the web is finished. This means that the entire design must be carried in the weaver's head from the beginning in order to create the complex symmetries here seen.

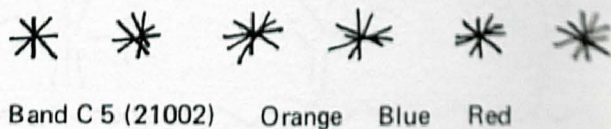
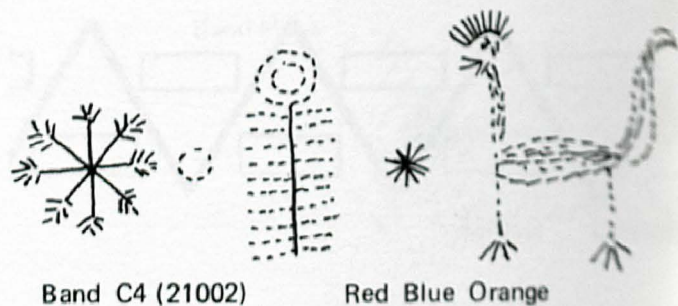
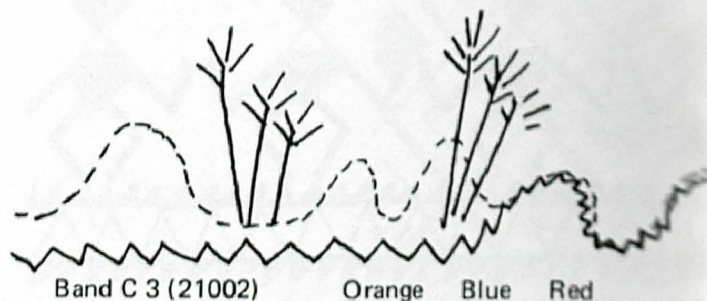
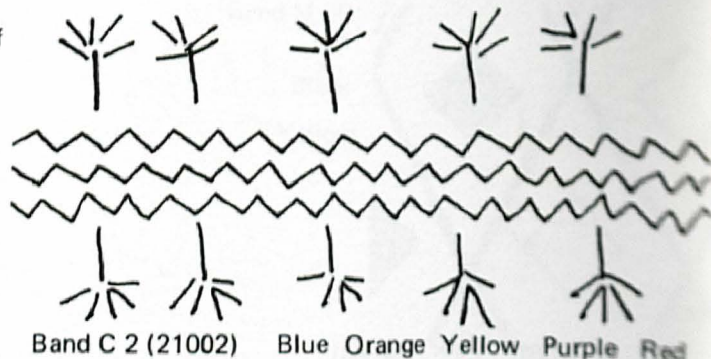
Huipiles of this order of symmetry are not typical of all highland groups. Many of them are of the utmost simplicity, as the huipil of Chamula, which is of black, gray or brown wool, with or without a fine pinstripe of black, gray, white, or brown, invisible at a distance of three feet. The webs are joined with bright contrasting stitching (green is common). The overall effect is simple but very strong. Decoration is applied with an embroidery needle around the arm and neck

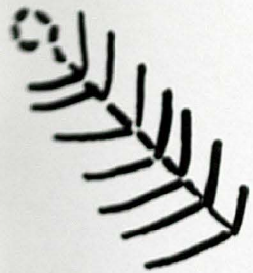
holes in green, red or orange and across the breast in a narrow band of seldom more than three inches, just above a cascade of of bright twine (in red, orange and green) and ribbons of many colors. This brilliant bouquet serves to completely emphasize the sober strength of huipil as a whole. The bands illustrated here are not actual bands in the same sense used above. Actually these are simply aggregations of motifs, either geometric (especially the zig-zag line) or mimetic (the flowers, animals, stars, trees).

While all Chamula women are more or less excellent weavers, there seems to be a wide variance in the technical skill with which the work is embroidered. Many garments are not embroidered. Many garments are not embroidered at all, while others are only worked around the holes through which the ties are run. With the exception of Band C₁ (from a Huipil) the other motifs have been taken from a woman's headpiece. There is little regularity and still less symmetry about this piece, and in fact the weaver seems to have been playing while she worked, changing her mind as if working on a sampler not meant for show. For all of this, it is one of the most light-hearted and gay of all Chiapas garments. The difference between this approach to surface design and that of the women from Magdalenas or San Andres could scarcely be greater, and it is a difference that may be seen to a heightened degree in the costume of Huistan.

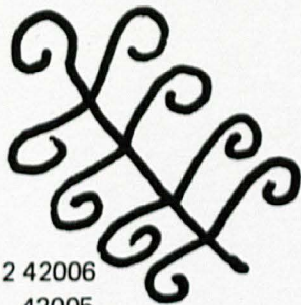
Most of the work done is Huistan is of relatively coarse cotton woven unusually tightly, resulting in a fabric of some weight and thickness. It is left white and is scantily adorned (often not at all), primarily in black embroidery, with occasional uses of red thread as well. Of the many garments in my collection only seven motifs show up (compared with better than thirty from Tenejapa) and none of these is drastically dissimilar from the other, once they have been sorted into stitchery and embroidery. That is Motifs H1-H4 have a strong family resemblance as do H5-H7. (The catalogue reference number gives a notion of the relative frequency of occurrence, although all items from Huistan have not been included.) These done in bright red or deep black, scattered on the surface of the garment, have a strong effect, and seem, of all the costumes of the highlands, to have most in common with 20th Century design principles. One item, a shawl does have a black woven edge, surrounding a large white interior. Here, floating off center, are three examples of H₂. The restraint is noteworthy, particularly when contrasted with the relative excess of Magdalenas. This shawl (Cat. No. 42.007) has the dignity and simplicity of a Shaker altar cloth.

If the Chamulans and Huistenos embroider simple motifs on plain backgrounds, and the San Andres and Magdalenas brocade elaborate geometric bands, there is a third major group, containing those who weave striped cloth or stripes

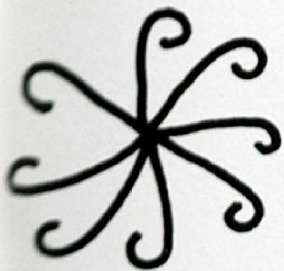




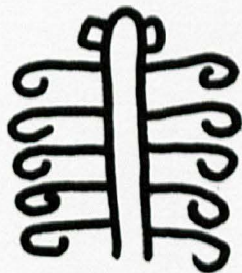
#1 42005



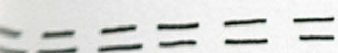
H2 42006
42005



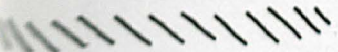
#4 42006



H3 42005



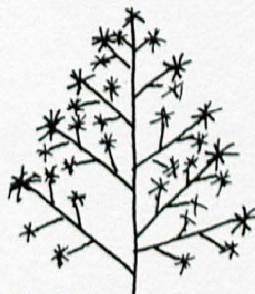
H5 42006
42004



H6 42006
42005



H7 42009



Red, Blue

into their cloth, which is subsequently embroidered (or, rarely, brocaded). Pre-eminent here are the weavers of Zinacantan, Oxchuc and Cancuc. The basic cloth of Zinacantan is one of red and white pin-striped cotton. Out of this are constructed all manner of garments, shawls, ponchos, tortilla bags, and carrying cloths. The most elaborate embroidery takes place on the tortilla bags and carrying cloths and along the edges of the ponchos and shawls, particularly and most commonly around the tie holes. Any number of stitches are used in creating these designs, but many of them are variants on the zig-zag, although the Zinacantecan women are capable of the full range of Western stitchery. On several occasions I have seen shawls sold by Zinacantecan women to shopkeepers in San Cristobal that were done from Western pattern books. While the designs were prosaic in our terms (Scottish thistles, cat curled on a hearth rug) the workmanship was spectacular. But when these skills are used on traditional motifs, the consequences are overwhelming. An example would be a Zinacantecan carrying cloth, about four by six feet, all of red and white stripes, (Cat. No. 110.011). Across this at intervals of a foot run three zig-zags in bright colors. At one end of the cloth stand two rows of trees, their feet planted in the zig-zag. One is all of orange, the next of red and blue, a third of purple and green, one of violet and yellow, another of orange and blue. The exuberance of each tree is sufficient but in this circus of colors the total effect becomes one of jumping in the air on a sunny day. Against the background of red and white stripes the effect is not only more telling, but utterly amazing, and probably completely beyond the talents of Western artists of the most creative stature (i.e., including Miro, Matisse in the collages, and Picasso).

Opposed to the basic order of Zinacantecan costume, where the red and white pinstripes constitute the background equal (which is to say that the observer is never tempted to regard either the red or the white stripes as figure or ground with respect to each other, but both together as ground), are the stripes of Oxchuc. On the huipil these consist of three vertical stripes of red, one running up the center (a solid red stripe obscuring the join between the two webs), the other two on either side about a foot from the center. These stripes of red are edged in a fine line of yellow. While the three together are clearly figured against the white cotton ground, the gestalt is a ground against which are embroidered, in similar or other colors, floral motifs or bands of color two to three inches long. The arm holes and neck hole are similarly decorated, though on occasion this decoration can assume the elaborateness of the breast work seen in San Andres (rarely). These bands or floral motifs float freely, seldom tied even symmetrically to the red background stripes. On the man's garment the stripes are to be found exclusively on the sleeves, while the back and front of the poncho are worked in bands

of color, two to three inches long, floating freely on the white ground. The effect is one of some daring, as if the weaver were unafraid of letting these elements run amuck, and the tension established between these free elements and the underlying symmetry of the ground stripes is compelling. The costume of Cancuc is similar, although the emphasis in the colors is on the orange rather than red (except in the Carnival costume, where the orange sleeve bands are displayed on a field of red and white stripes reminiscent of Zinacantan).

Some costumes cross the boundaries established in this tripartite division, as for example in San Miguel Mitontic and San Pedro Chenalho, where the work around the neck hole and across the shoulders is generally brocaded in the fashion of Magdalenas or San Andres (although the design motifs are quite distinctive, including a fundamental square element), while at the same time the cloth on which this work is done contains broad red stripes in the manner of Oxchuc or Cancuc. Still other costumes have nothing to do with these larger patterns, as is the case with the essentially purchased costume of Amatenango and Aguacatenango, or the radically different costume of V. Carranza, elaborate brocades being worked on a filmy cloth appropriate to the warmer lowland climate of the town. These last three costumes constitute such radical departures from the bulk of the highland costumes that they will not be further discussed in this paper (but see Cordry and Cordry, 1968, 335-339 for a description of the costume of V. Carranza.)

This brief and unsystematic perusal of the costume patterns of the Tzotzil and Tzeltal communities is all that can be tendered in the brief space of this paper, but it must serve to make several points. In the first place it is clear that the costumes vary widely from place to place, from the simple sparse black embroidery on the white cotton clothes of Huistan, through the relatively simple embroidery on the striped materials of Zinacantan or Oxchuc, to the elaborately brocaded fantasies of Tenejapa or San Andres. It is also clear that these patterns vary along a number of dimensions, including complexity and number of design motifs and bands, presence or absence and complexity of their symmetrical arrangements, simple variations of the motifs themselves, and color and color families. Variations along any one of these dimensions would be sufficient to distinguish the members of one community from those of another, and yet we find ourselves in the presence of an embarrassment of riches. It must, then be equally clear, that reference to these patterns alone is quite sufficient to distinguish group from group, without reference to the configurations of garment types (as, for instance, the pajama-like pants and the pancake hat of Huistan or the short shorts and beribboned hat of Zinacantan), although as we observed above, these configurations alone are also nearly sufficient. This radical redundancy of clues provided for

making the distinction among communities suggests the possibility that, inasmuch as the distinction can be instantly made on the basis of the gestalt perception of the entire ensemble, individual components of the costume may carry other burdens meaningful outside the necessary considerations of distinctiveness. These might include symbolic significance meaningful within the community,⁶ the development of degrees of freedom of operation for the weaver within which to demonstrate intracommunal individuality, not only her own inventiveness, talent and skill, but also affection for her husband or other family member (or disdain), womanly ability in general (as manifested in her ability to clothe her family), wealth, piety in its largest sense, and fundamental comprehension of the way of life of her community. Thus, just as evolution has granted homo sapiens the ability to respond in widely variant fashion to a given stimulus, so the elaboration of the costume has provided the highland Indians with a mechanism through which to manifest a broad set of highly variant significations. It is to these issues, the development of the costume and the generation of the patterns, that we now turn our attention.

STRUCTURE INTO PROCESS

It is all well and good to describe these patterns, structures composed of bits of yarn, creating structures of design, compiled onto structures of costumes, underwriting structures of custom, limning structures of communities, tied into increasingly larger social and political structures, interwoven with the physical structures of rock and rain, soil and sun, making up that total geographic structure that is some mad description of what is there in the plurality of its being and the florescence of its interconnections. But, no sooner is it described than it becomes a memory, a trace of something that was or might have been. Structures ineluctably transform themselves into other structures, which, being described, transform themselves into still other structures. These evanescent structures have themselves a structure, infinitely more complex than any component structure, and this structure of structures is process. Many people want to regard the description of a process as explanatory, as if it explained, in some mystical way the most recently described structure. But this is sophistry. The description of a process is the same order of work as is the description of a structure, the difference lying in the fact that the events of a structure are relatively synchronous, while those of a process are relatively chronologic. The distinction does not lead to explanation, but to a comprehension of the processual structuring of existence, here or in the highlands of Chiapas.

Frank Cancian says, "Change is frequent in Zinacanteco life. It was only twenty-five years ago that land reform broke

up lowland estates and transformed the great majority of Zinacantecos from peons to independent peasant farmers" (Cancian, 1974, 50). And, belying the relative permanence of the structures described above, this is how dynamic the processes are in operation in the highlands today. But change has not always been this dramatic, although it has been constant. It is presumed (Vogt, 1969c, 25-28) on the basis of comparative Maya linguistic data, research on the domestication of corn, and other information and hypothecon that a proto-Mayan community of about five thousand with a subsistence agricultural system based on fully cultivated corn existed around 2600 B.C. in the highlands of northwestern Guatemala (Department of Huehuetenango). As this protocommunity expanded, it fragmented, and groups left the protocommunity moving into the surrounding areas. The fifth group to leave was the Tzeltalan, which left somewhere around 750 B.C. stopping initially in the lowlands of the Usumacinta River Basin in the vicinity of the borders between Guatemalan Peten and Mexican Tabasco and Chiapas. During the time they spent here it is postulated as likely that the Tzeltalan participated peripherally in the Classic period of Maya development (A.D. 300-900), leaving the area and moving west into the Chiapas highlands between A.D. 500 and 750. The Tzeltalan differentiated into the Tzotzil and the Tzeltal in the vicinity of A.D. 1200. This essentially inferred picture is strongly supported by the archeological work carried out in the highlands by Robert Adams (1961, 341-360) who noted scant and scattered population during the Preclassic, a marked increase in population during the late Early Classic (the period postulated for the arrival of the Tzeltalan in the highlands), and by the Late Classic "nucleated ceremonial-dwelling centers widely distributed on steep easily defended headlands" which "pattern was replaced gradually during the Postclassic period by one in which more intensive use was made of the larger, more strategically located valleys" (341). By the time of the Spanish conquest, all evidence supports the contention that, while trade with other Mesoamerican groups was rapidly increasing, the region was nonetheless, relatively isolated. This preconquest picture describes a situation markedly similar to that found today.

Vogt says: "Although present evidence suggest that the highlands were not subjected to heavy Aztec influence in the pre-Columbian period, the Spanish conquest in the 16th century and subsequent developments during the 17th, 18th, and 19th centuries did have an important impact on the Indian cultures of the region" (Vogt, 1969a, 143). Elsewhere he adds:

As soon as possible after open hostilities ceased, the Spanish proceeded to establish encomiendas, which granted both large tracts of land and the services of Indian residents on the land to the conquerors. They also soon began to practice policies of reduccion and agrupacion to bring dispersed rural Maya populations into manageable administrative units and facilitate the conversion of the Indians to Christianity. (Vogt, 1969c, 28).

In the area around San Cristobal there was significant change. The ceremonial centers were turned into cabeceras, with their churches, town square and neat right-angle grid street pattern. During the two hundred years following the conquest the bulk of the Spanish and Christian elements currently seen in the culture of the highland Indians were absorbed, digested, and fused with pre-Columbian Maya beliefs, attitudes and cultural patterns. During the 18th and early 19th centuries, as Mexico gained its independence from Spain, Spanish-Christian influences declined, and a number of suppressed Mayan elements re-emerged, to form a new and highly stable cultural gestalt. During the latter part of the 19th century, in the so-called Pax Porfiriana, an export coffee industry established itself in the highlands of Chiapas and Guatemala which led to the erection of new mechanisms to exploit Indian labor (and the painting of a fine, nearly transparent layer of German influence over the region). This period, saw one of the two Indian rebellions to have taken place since the conquest. The Mexican Revolution set in motion trends which have and continue to have, profound effects in the highlands. Land reform, mentioned by Cancian, has transformed the lives of numbers of Indians: improved medical assistance has lowered the death rate so substantially that an explosive growth of population has resulted, leading to new and heavy pressures on both the social and economic structures of the communities and the region as a whole; the National Indian Institute (INI) manifests both the greater respect shown Indians and Indians customs, as well as the national concern over their educations and futures. As Vogt concludes his discussion of these materials: "Far from becoming a vanishing race, the contemporary Maya-speaking peoples are some of the most vigorous in all of Middle America" (Vogt, 1969, 29).

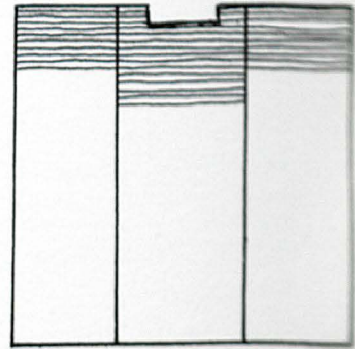
Clearly, this synopsis of the history of the Txeltalan touches briefly on only the most significant and obvious changes they have undergone. But it should provide a line of reference for an even sketchier and more hypothetical discussion of a similar history of their costume. If the costume is as integral to their culture as I have argued it must be, then it should reflect all (or at least many) of the changes enumerated above. Unfortunately our data are extraor-

dinarily poor, but they are all we have to work with. What do they tell us?

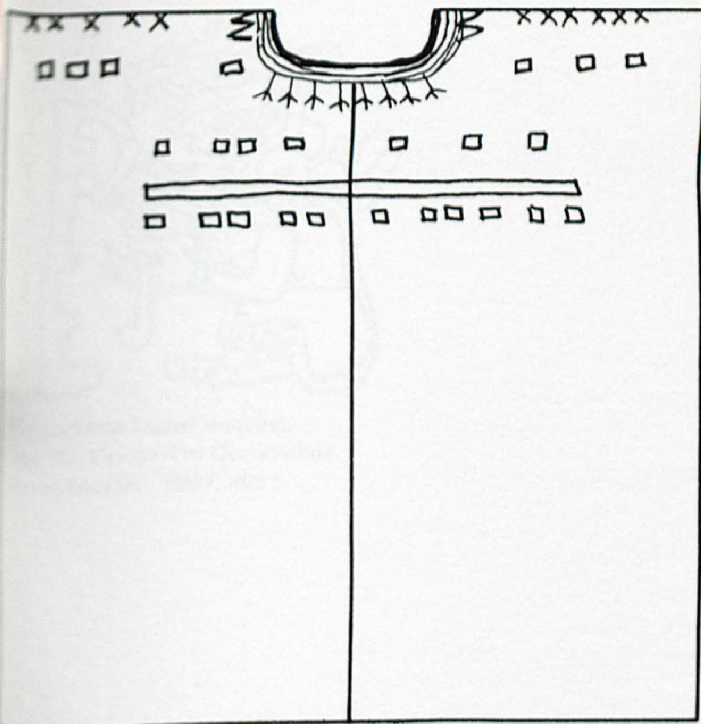
A. THE MAYAN PROTOCOSTUME

It is only fair to say that there is no protocostume for the Maya, or for that matter, any other people, though one could with an immense amount of work, be created, not along the lines of comparative linguistics, but along those of comparative folk tale studies, particularly the so-called Finnish approach, in which tales are broken down into motifs from which tale types are constructed. Thousands of tales are then compared and an analysis of variants leads to the construction of a prototale or Ur-type (Thompson, 1946; 1955-1958; Aarne, 1961). Such a motif index and costume type could be created for the highland costumes, drawing on the resources of the major collections (Museo Nacional de Antropologia, Mexico; Musee de l'Homme, Paris; Museum fur Volkerkunde, Basel; Middle American Research Institute, Tulane; and others not to mention the private collections of the Cordrys, Duby de Blom, Hernanz Humbrias, myself and others, some of which are larger than the institutional collections). This would allow us to construct fairly readily a Tzeltalan proto-costume, which could then be compared with similar protocostumes that could be developed for the highlands of Guatemala (drawing, for example, on O'Neale, 1945, and the even more numerous and larger collections of Guatemalan costumes). The work could and should be done, but since it is not, it is good we can punt.

Gayton says: "In native habits of weaving and dress Mexico and Guatemala are essentially one, differentiated by variations subordinated to the Middle American whole" (Gayton, 1969, 155). Gayton's evidence is highly anecdotal but it is possible to substantiate it in a similar fashion. Anyone familiar with costumes from the Maya of the Guatemalan highlands could instantly cite a number of impressive similarities and differences. The similarities include similar garment types (O'Neale, 1945, 105-215), similar weaving techniques (31-84), similar materials (cotton, wool and silk) and methods of preparing them (7-29), and a similar integration of weaving into the larger functional activities of the communities (219-245). The difference would revolve around a superficial lack of similarity among the costume patterns, particularly in the use of plaids and colors and the overall impression, but it is of course just such differences that we would expect to find between peoples separated for some 2700 years. Further, a closer examination of the motifs displayed on the Guatemalan costume shows a remarkable overlap with those employed in the costumes of Chiapas, as do the design areas on the costumes of both regions. Compare, for instance, this huipil from Chichicastenango (O'Neale, Figure 24,d) with



Huipil from ChiChicastenango, Guat.



Huipil from Santiago, Atitlan, Guat.

that from San Andres or Magdalenas illustrated above. Or compare the illustration of the huipil form Oxchuc with this from Santiago Atitlan (Figure 47, g), above which O'Neale laconically remarks that the distribution of the motifs is not to be explained by the techniques employed in weaving. She does, further, say the following; echoing our own discussion of the Oxchuc example:

Freehand weaving of types employed for the bulk of highland textiles can be held the cause of many irregularities of motif sizes. The stick-loom weaver sees the whole composition of her long weavings only if she unrolls her work. That handicap does not explain the eccentricities of some small weavings. Various design-motive arrangements represented diagrammatically appear to be too consciously informal not to raise the question of the objectives. (O'Neale, Figure 47).

Without knowing the frequency with which her design elements appear it is difficult to systematically compare her presentation of Guatemalan costumes with my own collection of Chiapas costumes, but a superficial examination reveals better than seventy-five motif identities, without respect to the larger set of identities, mentioned above concerning materials, techniques, and garment types. That these similarities are Mayan and not a function of larger Mesoamerican, Latin American, or weaving considerations (technical aspects that might cause certain forms to result from the nature of the medium) can be readily demonstrated (albeit anecdotally) by comparisons with the other Mexican costumes displayed at length by Cordry and Cordry (1940; 1941- and these Zoque live adjacent to the Tzeltalan; 1968), with the large collection of Bolivian textiles so clearly analyzed by Girault (Girault, 1969) and other similar collections around the world. To be sure, certain of the motifs employed by the Tzeltalan (the lozenges, the zig-zag) are nearly universal, and are easily generated on the loom. But their combinations, reflections, multiplications, the other motifs, the family of symmetries, and so on are uniquely Mayan.

There are certain other data that tend to confirm the character of these costumes. The first of these is that in speaking of costumes from the highlands of Guatemala we are speaking of the costume of a number of Mayance peoples, including the Mam, Quiche, Ixil and other smaller groups (something insufficiently dealt with in O'Neale's monograph). That is similarities already remarked upon between Chiapas and Guatemala are not merely of two places but of better than ten distinct groups of Mayance peoples. The second of these is the extensive trade in clothing among many of these groups. Thus Starr, Blom and La Farge, Nash and others have noted the prevalence of Guatemalan wool ponchos in the Tzeltalan

region, particularly in the north (Sivaca, Tenango, and so on) and the south (V. Carranza, Amatenango and the like). As we know, the bulk of the Amatenangan costume is made in Huehuetenango (Nash, 1970, 63). On the other hand, very little trade in clothing is reported from the Chiapas highlands into other parts of Mexico, with the exception of some plain cotton cloth traded from V. Carranza into the Zoque region surrounding Tuztla (Cordry and Cordry, 1941, 47). That is, the vast bulk of the trading in costume materials is carried out within the Maya highland area. Without belaboring the point, I think it is safe to conclude that the Tzeltalan costume is a subtype of the greater highland Maya costume complex.

But if this is so, then it is not unreasonable to examine the historic evidence relating to the costume of the ancient Maya in order to approach the protocostume from a slightly different angle. Unfortunately, here too, there is a lamentable lack of data. Morley says:

No textiles from the Old Empire Period have survived and only a very few from the New Empire Period. A few fragments of white cotton cloth, said to date from just before the Spanish Conquest, are reported from a small cave near Tenam in the highlands of Eastern Chiapas; the supposed late New Empire origin of this cloth is based upon the type of pottery associated with it. Numerous small pieces of carbonized cotton cloth, which show many different and complicated weaves and which also date from the late New Empire times, were recovered from the Well of Sacrifice at Chichen Itza. (Morley, 1947, 405)

Similar conclusions have been reached by others (Johnson, 1954; Spiden, 1957; Mahler, 1965; Cordry and Cordry, 1968, 5-9). Most of the extant fabrics consist of small pieces, helpful in coming to some understanding of ancient weaving techniques (for example) Johnson, 1954, found batik and hand painting employed on the fabrics discovered in the highland of Chiapas), but less helpful in reconstructing the patterns thus created (although Mahler, 1965, has attempted to complete many of those found in Sacred Cenote at Chichen Itza). Nonetheless, the surviving basreliefs, statuary, figurines, codices and account of the conquistadors bear ample witness to richness and variety of pre-Columbian textile art among the Maya. The work of the Old Empire (Classic) seems to have rivalled that of the ancient Peruvians whose textiles have survived in large quantities and which demonstrate weaving art of the very highest quality and at almost incredible complexity and fineness, while that of the New Empire seems to be simpler and at times even schematic. In reviewing some of this material, three concerns would seem to be paramount; the extent to



The goddess Ixchel weaving.
Page 79, Codex Tro-Cortesianus
(From Morley, 1947, 408.)

which the technical apparatus of the ancient Maya survives among the contemporary Tzeltalan, the degree of similarity between the garment types of these two groups, and the nature of the relationship between their surface decorations.

As to the first point, there can be little question that the stick loom used in the highlands today was identical to that used by the ancient Maya. As Morley illustrates: "An ancient representation of this same weaving technique appears in the codex Tro-Cortesianus, where a female counterpart of Tzamna... is shown weaving, one end of the loom being tied to a tree and the other wound around the goddess' waist, shuttle in the left" (Morley, 1947, 407-408) exactly as practiced today.

There were other similarities, including the fact that the threads were dyed in all cases prior to weaving instead of dying the completed fabric, the predominance of cotton (wool and silk were introduced by the Spaniards), spun in an identical fashion, the heavy use of brocade and embroidery and still others. Feathers were apparently used extensively as they were among the ancient Peruvians and this is no longer true today, although feathers are still worked into the wedding huipil of the Zinacantecos which has other pre-Conquest attributes, especially the rectangle decorating the breast of the garment. The most serious difference lies in the nature of the dyes, commercial aniline dyes having nearly extinguished the use of native vegetable dyes in the highlands (and for that matter almost everywhere). Weaving even occupied the same place in the life of the women. If weaving defines womanhood in San Pedro Chenalho today, it did likewise in pre-Columbian Mesoamerica. Cordry and Cordry say:

Fray Torbido de Motolonia tells us that children were given a name on the seventh day after birth and that... "if it was a male child, they put an arrow into his hand, and if it was a female child, a spindle and weaving stick (shuttle), as a sign that she should be diligent and housewifely, a good spinner and a better weaver." (1968,6)

Clearly among both the ancient Maya and the Tzeltalan of the highlands we find as nearly identical a weaving complex as could be expected with the passage of the five to twelve intervening years.

When it comes to the question of garment types the issue is slightly more complex, but the Tzotzil and Tzeltal seem to wear a garment that resembles that of the pre-Columbians to a greater extent than is true of any other indigenous group in Mexico today. Cordry and Cordry say that "The principal items of men's apparel which have retained to some degree their ancient character are belts and sandals" (1968, 163) and this is certainly true in a heightened degree among the

Tzeltalan. Many commentators have remarked on the high-backed saddles worn by the Zinacantecos on ceremonial occasions which are identical to those found on ancient Mayan bas-reliefs (Cordry and Cordry, 1968, 164; Vogt, 1969d, 108) as well as on the resemblance between the belts worn by many highland groups with their elaborately decorated ends worn so as to display them prominently, and the decorations on the ends of the ancient Maya loin-cloth. Compare this description from Spinden:

The everyday dress of the men was a sort of breech cloth that passed around the hips and had end flaps hanging down in front and behind. In the ancient sculptures these apron-like flaps are often embellished..... Often aprons have a sort of openwork design in the center and a fringe at the bottom. (Spinden, 1957, 148-149)

with this from Blom and La Farge on the Tenejapa of the highlands: A sash of white material may be worn, the ends of which, hanging down in front, are elaborately embroidered" (1927, 393). On ceremonial occasions the sash used in Tenejapa is extraordinarily elaborate and frequently worn in the manner of the ecclesiastic stole, with the long ends flat against the body, displaying the embroidery to best advantage (see Plates 80 and 83, Duby, 1961). A fringe more often than not terminates the sash, and the garment and the manner of wearing it is common among the Tzeltal to the point of being a distinguishing characteristic, as well as among the Tzotzil of Chalchihuitan, Magdalenas, Santa Marta and other communities in their general vicinity. While the loin-cloth itself may not have survived the conquest of the pants, its decorative function is retained in the highland sash. (It may also be critical to note that the designs on the sash ends are identical to those used on the woman's huipil in many communities, thus providing both sexes with similar motific material.)

Another survival, and one not previously commented on, is also common among the Tzeltal, Spinden describes this garment:

A garment in the form of a short skirt reaching half-way down the thigh is sometimes seen upon figures which evidently represent men....The belt at the top of this short skirt receives the greater part of the decoration, which is usually of geometric style. (1957, 149)

What Spinden mistakes for a skirt is actually the bottom of the typical male tunic, flared out by its straight cut, and constrained by the sash. This is perfectly illustrated by Duby's photograph of an Oxchuc youth (Plate 88, 1961) and is seen on nearly every northern Tzeltal male. Comparison with Spin-

den's illustration makes the identity luminous. The sash, of course is the decorated one described above. Speaking of this part of the costume Blom and La Farge noted that in Tenango "the trousers are usually rolled up until almost hidden" (1927 181) and none of the plates from Duby (1961), photos from Hernanz (nd), other sources or may own personal experience can I find cases where the trousers or frequently shorts) reach far below the bottom of the tunic. In point of simple fact it would seem that the greater part of the male Tzeltal costume is a direct survival from pre-Columbian eras. Nor have we touched upon other survival including the hats of straw with pointed crowns (Cordry and Cordry, 1968. 166) worn by the men from Tenejapa, Chenalho, Mitontic, San Andres and other communities; the headclothes used in many highland towns, most spectacularly in V. Carranza (Cordry and Cordry, 1968, 163, 164, and 166, where they state that cloths tied about the head occur in pre-Columbian codices and sculptures and also worn over the shoulders as was the pre-Columbian timatti; nor Vogt's suggestion of functional substitution as in the case of the ribbons hanging from the hats of the Zinacantecos, San Pedrans, San Migueleranos and others, which he argues may represent "the contemporary version of the feathered headresses worn by the ancient Maya men" (Vogt, 1969d, 108). From head to feet, the bulk of the male highland costume would seem to be a survival in its essence of the ancient Mayan apparel.

What has been said of the male costume holds to an even greater degree for that of the women. The four major articles of dress are distinctly pre-Columbian: the huipil, the wrap-around skirt, and sash, and the rebozo or shawl. Unfortunately it is not clear that they were not also Hispanic, so that the form they take today may represent some fusion. This is probably more true in other parts of Mexico than Chiapas. The wrap-around skirt was not used in Spain (Cordry and Cordry, 11) suggest that it just might be of Spanish origin). The huipil was certainly not in use in Spain at the time of the conquest although forms of the sash certainly were. In any event, the Cordrys are correct when they say (1968, 10) that "the contemporary woman's costume is composed of essentially the same garments as those of ancient times." Perhaps most significantly, neither of the two distinctively Spanish garments the gathered skirt and the blouse are today used visibly in the highlands to any extent. The most remarkable survival is the Zinacanteco wedding huipil mentioned before. This is a very full huipil, much fuller than any used ordinarily, of three plain white webs stitched together with green thread. Across the breast is a rectangle three to five inches wide and two deep in a variety of colors, while across the bottom of the huipil is further elaborate embroidery. Worked into these areas are white chicken feathers. In the example in my collect-

ion and in that shown by the Cordrys in Vogt (1969d, 209) they are there in abundance one associates with the feather work of the ancients.

In this brief survey we have omitted the discussion of the ceremonial costume at large because of its unending complexities not only in its variety, but in the melting of Hispanic and Mayan garments, as well as the more modern garments being continuously adapted - pants, shirts, rubber rain ponchos and hat covers, gathered skirts, store-bought blouses, store-bought cotton-- in the fluid process of existence, since these latter are not only not fully adopted, but clearly not of pre-Columbian origin.

Finally we must direct attention to the issue of pattern survivals in the surface decoration of the costumes. Here there is both the least likelihood of direct survival and the most tenuous evidence. The Cordrys argue that:

Designs on textiles showing survivals of pre-Hispanic influence that can actually be named seem few. It is possible that in the sixteenth century many designs were changed slightly (enough to make them unrecognizable now) to meet the approval of the Spaniards. (1968, 174)

They then list several, all of which may be found on highland costumes: the stepped fret or greco; a variation of this known among the Nahuas as *pato de tigre* (found in Tenejapa, Mitonic and elsewhere): a running triangular motif called "solar ray" or "fire serpent"; our old friend the zig-zag; variations on a number of ancient glyphs whose identification is highly questionable at this point; large numbers of other geometric motifs such as the chevron; and certain motifs mimetic of nature, which may be survivals or "reinvention." The problems are many. For one thing, when a weaver is willing to provide names and significations for patterns (and usually this strikes her as a ludicrous proceeding), it is found that other weavers in the same community give them entirely different names.

For another, many of the motifs are of world-wide distribution, and consequently, capable of wide-spread and frequent independent and repetitive invention. For a third, where an animal once used to represent a glyph and have formal significance, it no longer does so, and it is fatuous to insist on the ancient interpretation. The same is true of geometric patterns. As the Cordrys point out (1968, 180), multicolored chevrons once symbolized war, but I doubt that the many Tenejapa women with the motif running along their neckholes have any such intentions.

Against this gloomy picture are the following considerations. One: there are extensive similarities between the ancient and contemporary motifs. Two: the motific material found in the highlands in no way draws upon Hispanic motifs, or if it does it has been drastically altered and thoroughly incorporated into

the mainstream of indigenous design. And three: no real work has been carried out by anthropologists in an attempt to come to grips with these patterns in the highlands. Finally, there is the central thesis that, as important as these designs are to their wearers in distinguishing them from others and establishing their own identity, tied as they are to the very gods, it is incredible that they should be without meaning and significance and one tied, as are so many other aspects of their culture (not to mention their costume), to their Mayan past.

Let us assume, then, that they did develop from the designs of the Maya. How did these develop? Here we enter the realm of pure theory. The most popular notion is that argued by Spinden, and in other contexts, by James and Boas. James writing at the turn of the century, termed it, in his investigations of the significance of the designs on Southwestern American Indian basketry, convergent evolution, and in its broadest outline the argument goes like this. First of all there are patterns that are generated by the characteristics of the medium. James is speaking of basketry when he says:

It is possible that the first steps taken were accidental. In preparing the splints some may have been of a slightly different color from others. When worked into the fabric this difference would be noticed, and, either from curiosity or a desire to imitate, the original effect produced would be duplicated. Once started, the variations produced by color led the weaver along many paths, all of them novel, interesting and pleasing. (1903, 195)

This is as good a place as any to begin, for basketry proceeds weaving (as well as pottery) in the histories of most peoples. But he is soundly seconded by Neale, not with regard to the origins themselves, but to the excitement of weaving certain patterns because of the medium:

The weaving of the zig-zag has a peculiar fascination for some weavers—even modern craftsmen—for one reason because, like the diagonal of any regular twill, the pattern develops so quickly and visibly. Once the beginning line of floats is set, the methodical progression toward the right or the left over a predetermined number of warps governs the slant of the motive outline and repetition produces it indefinitely.....

The point is that if we accept James' accidental origin, or for that matter any other, it is not necessary to postulate a tricky process of passing on the discovery of the geometric pattern, because it lies in the logic of the weaving. (I know I don't have to point out the frequency of occurrence of the lozenge or zig-zig in highland weaving.) Every weaver, no matter that

the pattern lies about her in a thousand garments. experiences a strong sense of creation, not only in doing the pattern for the first time, but in seeing it blossom before her eyes for the hundredth time. For purposes of argument, let us accept this dual point, that the original discovery of pattern making was accidental and inherent in the logic of the medium.

Then, the argument of congruent evolution goes, there was simultaneously existent a strong impulse to imitative design, i.e., a desire to create patterns imitative of things seen, however seen, in the real world. This impulse led to the drawing of pictures or representations which, as the skill of the weaver progressed, individually and culturally, were gradually worked into the fabric. But the medium would have a strong effect on the character of these mimetic designs. It is difficult to produce true curves on the loom, particularly if the matrix is at all coarse, and there is a consequent tendency to an undeniable angularity about the human figures, animals, floral and other motifs that appear in brocaded work. It is when the weaver turns to embroidery that these can be most readily accomplished. What results is not a realistic portrayal, but a conventional one, and what thus exists within the weaver's repertoire of images are geometric design elements responsive to the weaving and technical complex of the weaver, realistic design elements perceived and occasionally produced (most closely in embroidery), and conventional design elements representative of a fusion of the foregoing two lines of development. Spinden terms this notion "involution" and says:

The general theory of involution given about accounts for realistic, geometric and conventionalized art existing side by side; the different degrees of modification according to this method do not require a time sequence. Of course time brings many changes. There is often a marked tendency for rich conventionalizations to degenerate into meager geometric moulds. But this is simply evidence of dissolution when the unstable compound of conventional art breaks down into its original components. (1957, 48)

This approach has the important advantage of embracing the fact that the three modes of design co-exist happily together, often on a single fabric or facade, while avoiding simple historic accounts that insist on the development of geometric art as a degeneration of realistic imagery, the elaboration of realistic art out of geometric material (both of which have a certain popularity despite their incredibility), and which sees conventional art as some evolutionary hangover to be treated, not by infusions of black coffee, but pattern books from Europe (while ignoring their own highly conventional aspect).

Both Spinden and James do insist upon a hierarchy of higher evolution, one that moves from the minor to the higher arts, i.e., from basketry to pottery, from basketry and pottery to

weaving, from weaving et alia to carving, and so forth. Or as Spinden says:

At a much lower stage of culture than that which obtained among the Maya, textile and ceramic decoration lead to the working out of simple geometric forms through the necessary limitations of method and material. Among the Maya the guilloche, occurring on pottery decoration of the Uloa Valley, antedates by centuries the same motive of decoration on buildings in Northern Yucatan. Similarly the fret appears as a textile design on the dress of figures carved upon the stelae and lintels of Piedras Negras and Yaxchilan long before it was developed as a pattern for facade embellishment at Uxmel and Chichen Itza. (1957,49)

There is, of course, the objection that this sketchy chronological sequence does not preclude other sources of influence, infusions of matter from other cultures, independent discovery, and so on.

This objection hints at the nature of the objection to the entire theory. While plausible, it is unsupported, especially by the clear chronologic sequences that would be needed to validate it. Spinden admits this objection in his analysis of the fret and the serpent head (47) and it has been recently raised (Deregowski, 1973, 184) to refute Boas' postulated evolution of the split-type drawing, which he felt evolved among the Indians of the North Pacific out of their attempt to decorate hats, bracelets, baskets and other solid forms, which were then flattened (as in the projection of a globe into a map), revealing the symmetric split-type representation. Deregowski's objection is that nowhere does Boas present the historical evidence needed to demonstrate this evolutionary sequence, while on the other hand Deregowski can demonstrate that split-type drawings are of nearly universal prevalence among children, and hence no evolutionary description need even be considered. Similar objections can be raised about the theory of congruent evolution, that is, that many of the conventional forms that should have developed evolutionarily are spontaneously present in children throughout the world. Clearly further ethnographic work among the Tzeltalan would be needed in order to substantiate any of these positions.



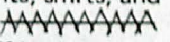

One position is shared by Spinden and proponents of a perceptual theory similar to that advanced by Gombrich (1960, 1973), Deregowski (1973) and others, and this is one of hierarchical integration which would permit all forms of representation (geometric, realistic, conventional and these in varying degrees of naivete and sophistication) to coexist simultaneously. Through an analysis of a number of huipiles from Tenejapa I would like to illustrate the richness of this co-existence, while simultaneously presenting a highly hypothetical

developmental sequence of the essential design motifs.

I want to argue that the resplendence of design to be seen in the geometric fantasies of the Tenejapa began in imitation, but not in imitation of a jaguar or star, lightning bolt or flower, but something much much closer to home, namely the stitches used to tie the webs together. You will recall that the weaver cannot, on the backstrap loom, create a piece of cloth wider than the lateral reach of her arms. In fact, given the maneuvering necessary at both edges of the fabric it must be considerably narrower. Thus, in order to create a huipil or tunic capable of enclosing the adult form, it is imperative to wear two or more webs sewn together. The Lacandon, an isolated Mayance people living in the lowlands of the Usumacinta basin to the east of the highlands who have, of all the Mayance peoples, been least (essentially not at all) influenced by the Hispanic incursion, do this, and very little more. Garments that have been worn for any period of time are uniformly gray, consisting of two webs of coarse weave sewn together up the center and along the sides. Closer examination reveals the remnants of fine red stripes, four in number, along the edges of the webs (Cat. No. I20.001) but no other decoration. An unused example (Cat. No. I20.002) is a creamy white with six bright red stripes. The costume is least adorned of all of those indigenous to Chiapas. (See Duby, 1961, Plates 100-138, for further evidence of the utter simplicity and elegance of this costume.) The **stitch** used to connect the webs is a simple binding stitch, and makes this pattern on either face of the garment: ~~#####~~

This exact stitch shows up on four of the six huipiles we shall examine from Tenejapa (90.004, 90.0012, 90.018, 90.019), but not on one which consists of a single web of store-bought material on which it would be ludicrous.

Significantly, the stitch appears only at the very bottom of the back and front of each web, where it would be hidden, since these ends would be tucked into the skirt-top. On two of these, however, the stitch is done in color, even at the extreme ends (90.018, 90.019) so that it becomes by virtue of that simple gesture not merely a binding mechanism, but a part of the decoration. At the same instant, the flood-gates of invention are opened, never to be closed again. The next step in the evolution of this motif is to make the entirety of stitch a part of the decoration. This results in the transition from ~~#####~~ to ~~#####~~ (a transition still not made on the decoratively-unconcerned operating table, where sutures continue to resemble the prosaic but sufficient binding stitch). Since this stitch is redundant and thus decorative, it never appears in white on any huipiles in my collection, but always in color (while the suture stitch is found in both white and color). This stitch is in both cases (90.004, 90.012) located between the suture stitch (in white) and the body of the design across the chest and shoulders, and proceeds up-

ward in particular, an inch or so of red followed by an inch or so of orange and so forth, On two other huipiles (90.018, 90.019) the suture stitch (in a single color) transforms itself into this  only the stitches are so close together that it looks like this . This work is done in strips of color, an inch of red, an inch of green, et cetera, as on the zig-zag stitch above, and always appears in colors, never in white. On one huipil, this stitch is the only binding stitch used, and it runs from the neckhole to both selvages, (90.004) All of these stitches, except for the white suture stitch, are decorative, but at the same time they do hold the webs together.. The same cannot be said for our final example (90.005) where the same stitches have become purely decorative. This is beautifully embroidered on store-bought manta (commercially woven cotton frequently used for men's pants, shirts, and women's underblouses), and the zig-zag stitch  which runs from the neckhole to the edges as if holding the webs together is entirely decorative, without any binding function whatsoever, although it occupies the position that the binding stitches would and is colored in an identical fashion. It is a rare woven instance of tromp l'oeil and belongs to the same family of effects as Marcel Duchamp's painted rip in *Tu'm'*, 1918, or the nail in Braque's *Violin and Jug*, 1910. Whether this embroidered simulation of a binding stitch was intended to be provocative, deceptive or more purely decorative we cannot know, but it likely produces responses appropriate to each interpretation in different viewers. The  effect also appears, but along the outer edges where it is also only decoration. (There does appear a hem-stitch along the bottoms of the huipil, something unheard of with home-made huipiles.) The largest technical differences between this huipil and the others are that the home-woven huipiles are stitched together, but decorated with brocade, while this one simulates both the stitches and brocade with embroidery. (Other examples of similarly embroidered zig-zags are mentioned by O'Neale, 1955, 94.)

My point is simple. The weavers in Tenejapa are aware of the decorative possibilities of this functionally necessary binding stitch, to the extent that where unnecessary, it is retained in its decorative aspect alone. This is not something passed down through the generations, for it is only the last couple of generations that have been able to avail themselves to any extent of the luxury of store-loomed manta. But if these contemporary Tenejapans behave in this fashion; can we not believe that their ancient progenitors did likewise? That is, could not the design possibilities of the zig-zag binding stitch have presented themselves to the weavers of these many years ago? And if they did, might not they have attempted to imitate this zig-zag in brocade? Thus the brocaded zig-zag would be the product of mimetic impulse, but not of the stars or the

fauna, but of something, very close to hand, a well-known and long-used stitch.

If such were the case, these weavers could not have hit on a more amenable point from which to launch themselves into brocading, for as O'Neale pointed out, the design is easy to work and almost hypnotically compelling in its unfolding. In its most basic form, it is also the simplest possible motif. Taken apart a two woof-strand zig-zag consists of nothing but two binary rows out of phase by half a cycle. Thus, the bottom row is a simple on-off pattern, where the on is represented by a figure (colored) strand rising above the off or ground warp threads thus: color-ground-color-ground or 101010 and so on. The row immediately above is identical, except that if the bottom row began with a 1, this begins with an 0: 10101010. The height of the zig-zag is determined by the binary code used. Thus an 0101 code generates a zig-zag two woof strands high, while 100010001 generates one three strands high, and 100000100001 generates one four strands high and so on.⁷ Once this principle is grasped, zig-zags of any dimension can be generated and they can be run with equal facility vertically or horizontally. On a number of huipiles from San Miguel Mitontic both horizontal and vertical zig-zags are found on the same garment (as in 57.009, 57.001 and others). Variations in the thickness of the "line" used to describe the zig-zag are similar function of the binary code. Thus, a line one warp strand thick is generated by a single 1 bounded by 0's, whereas a line two warp-strands thick consists of two 1's bounded by 0's, thus: 0110. In this way both the size of the zig-zag and the thickness of its defining line can be endlessly manipulated. And clearly the weavers understand these principles. The design is executed in the head and carried out as planned, for as must be well known by now, the fabric is rolled up in front of the weaver as she proceeds, and only a very small portion of the "present" (the past rolled up, the future latent in anticipation of the rest of the design) is there to be seen by the weaver at any time. To assume, under these conditions, that the weaver is unaware of the underlying principles of her design would be less than poultry.

I remarked earlier that the lozenge patterns were created through reflection of the zig-zag along its longer axis, but this is not precisely the case. Its generation is most simply accomplished by continuing the process that generated the zig-zag in the first place one more step:

	1010101010
In this pattern the lozenge can	01010101010
be seen by connecting any appro	1010101010

propriate four 1s or 0's. And just as the zig-zag can be modified to create zigs of whatever height, or thickness, so this arrangement can be manipulated to create lozenges of any size. The extent to which this is understood by the weaver can be seen on a small huipil from Magdalenas of the late 1950's (54.006) which is a veritable summa zig-zagtica. All of the

stitches demonstrated on the Tenejapan huipiles can be found here (except the trompe l'oeil one) as well as the full range of basic lozenge motifs. But astonishingly a number of the zig-zags are picked out in different colors so that they look like

003000300

020202020

this 100010001 where 1 is pink, 2 is green and 3 orange,, which is reflected in the zig-zag next above it (if the lower one is 1,2,3, then the upper one is 3,2,1) while yet others have two rows of one color, the third in another, while yet another group has all three rows in the same color, as if the weaver wished to demonstrate her comprehension of the generating principles. In still a fourth set she has added the three rows together in exactly the fashion hypothesized as generating the lozenge but in green, orange and pink as shown here:

030303030303

202020202020

010101010101

These zig-zag bands not only mediate more elaborate bands of lozenge material, but as if to make it clear that the individual unit in the larger pattern, these zig-zag bands also frame a row of independent lozenges floating in space. Finally, individual zigs have been picked out to become chevrons, which are stacked one above the other.

This sequence of development, from the binding stitch in its functional role to its decorative role, then its imitation in brocade, its manipulation to create fields of lozenges, and finally the extraction of the individual lozenge and the chevron is, for all its plausibility, merely hypothetical. There is not one trace of historical evidence to support it. Nor would it help to continue it to show how it continues, to generate the greca for example, and to provide the mold in which other imitative impulses are cast, such as the men which occur on the huipiles of Magdalenas, Santa Marta, V. Carranza and other towns. Nonetheless it is plausible, and to the extent that it rids us of the "accidental discovery" postulate, replacing it with a conscious desire to imitate the binding stitch and the consequent requisite experimentation, more comfortable. And it is consonant with our data. So let's accept it for the moment.

Needless to say, none of this goes on in a vacuum. Whatever the origin of these motifs, once existent they could be recognized as any number of objects in the world or the imagination and so acquire names and meanings, symbolic attributes that would enable these motifs to resonate powerfully in the culture at large. One function of this resonance would be to channel further development of the motifs along their most meaningful lines. Thus, a zig-zag which began in imitation of a binding stitch, might be recognized as lightning, a solar ray, a serpent, water and so on. These associations would guide its development to make it more like these than it was

before, or determine the embedding context, so that the zig-zag as serpent could be removed entirely from the fabric to become part of the design of a temple, modified through the mediating influence of brick or stone, and then reapplied to the textile as something altogether different than it was when it left; a symbol of life, or death, or war, or movement. And so, coursing through the Early Classic, the Classic, the Post Classic these motifs would acquire and lose endless significations and be endlessly modified in shape, size, color and character. But if the postulated sequence has any validity, they could be also endlessly reinvented afresh, to constantly reinvigorate this pool of imagery and interact with it, through the sheer sensual pleasure and fascination of the weaving and the construction of the clothing.

B. THE MODERN PROTOCOSTUME

While the history of the Tzotzil and the Tzeltal is, like all history, one of change, few changes could have been more significant than the Spanish Conquest, with their new material culture (wool, pants, metal et cetera), their new social order (especially the policies of reduccion, agrupacion, and the institution of the encomiandos) and their new gods and votaries. Since we not only lack a Mayan protocostume, but any real idea of what these Indians were wearing at the time of the conquest, it is difficult to assess the changes caused by the conquest. There are only hints.

Among these hints one in particular stands out, and that is that the Indians used their resources to create, a new costume mimetic of certain aspects of clothing styles found among the Spanish, exclusive of such considerations as their adoption of trousers, where the influence is undoubted. While there is no reason to doubt that the costume of the various pre-Conquest communities was differentiated, it is unlikely that it was differentiated along the lines found today. We have already quoted Blom and La Farge (1927, 400) to the effect that the hat of the Huistenos might have been modeled on that of their patron San Martin, and noted that the costume of the saints is frequently that of the community as a whole. Further, the whole history of Mexican art of the sixteenth and seventeenth centuries is one of Indian artisans working out Hispanic motifs and subjects, and nowhere is this more true than in the area of ecclesiastic art. Thousands of churches and monasteries were built and decorated by Indians, who infused the Spanish iconography with a new blood, Cali says:

In the daytime the friars taught the children to read, write and sing, also to carve and paint, and the first native Christian artists were children who were taught the rudiments of Catholic art together with their catechism. And it was they who decorated the early parish churches, copying the sacred



pictures given them by the monks when they learned their lessons well... (Cali, 1961, 120)

It seems likely that most of the Indian craftsmen did not know the standard works prescribed on architecture and sculpture and were content to copy the examples provided for them by the friars as faithfully as they could... Travelers who saw the work of native Indians tended to criticize their ignorance of bone structure and classical anatomy rather than to appreciate their feeling for the sacred. And indeed their statues and paintings were but naive expressions of simple faith; thick layers of bright color or the sheen of gold on a statue mattered more to them than the quality of its carving, which was often crudely symbolic. (68-69)

Naive copies of European masterpieces--Flemish, Italian or Spanish--from engravings found in prayer-books or catechisms these pious Indian madonnas are not masterpieces. They make no claim to be. But we can see now that they have the awkward grace and sometimes the genius of primitive artists, a brightness of color that is refreshing in its naivete, a change from the schemes of the great masters... The sacred art of the Indian is an art of the people, and middle-class travelers often disliked it, yet satisfied friars... (75)

And what could please the friars more than that the Indians should bend their costuming resources to the creation of a costume patterned, more or less, on those of their particular patron saint. The Cordry's explicitly suggest clerical influence in the costume of San Jose Miahuatlan (1968, 166). Why not here in the highlands as well? One anecdote and a supposition is not much to go on, but perhaps we can corral some further evidence short of what is needed--a complete hagiography of the saints brought to Chiapas by Diego Mazariegos and the Dominicans as well as an iconography of the images of these saints presented in the missals, prayerbooks, and other items printed by the Plantin Press of Flanders which had the exclusive privilege of printing, the religious books distributed in New Spain for nearly three-hundred years. Consider, instead, the images created during the colonial period in the rest of Mexico and New Mexico, as well as the traditional garb of the saints preserved in the New World today. St. Lawrence, for example, the patron of Zinacantan is traditionally shown wearing a deacon's dalmatic, an outer vestment usually of white decorated in embroidered stripes, one on either side, in red. In a New Mexican Colonial portrayal (Breese and Boyd, 1966, 26) the dalmatic has become vertically striped, perhaps as a consequence of an attempt to create the illusion of folds of the garment, but the decoration that should occur on the two panels has spread across the entire surface of the garment. St. John, on the other hand patron of Chamula, is

usually presented in a black cassock (Breese and Boyd, 24) though not always. For example, in the Cathedral in Mexico City is a late 16th century San Juan (Museum of Modern Art, 1940, 97) whose cassock is elaborately brocaded (simulated in gilded and painted wood) Yes, and so on. Certainly the usual portraiture of San Lorenzo rings some bells with the costume of the Zinacantecan male, just as that of San Juan rings some with that of the Chamula male. But, it is not enough. There are too many questions, too many contradictions to even build sand-castles in Spain. But enough to add one more filter to all those already named, through which the costume of the Tzotzil and Tzeltal might have washed, and enough to note that, were conscious imitation of saintly or clerical clothing to be found to play a part in the development of the costume, that it would have taken place synthetically, merging the pre-Columbian elements into these later forms, using the old brocaded motifs to approximate the new brocade simulated on the wooden surfaces of the new icons, resignifying both the older elements and the newer ones, creating something never before known,

Only one thing is clear about the post-Columbian costume in the highlands and that is that it had stabilized into close approximations of current forms by the late nineteenth century. Photos taken then (Starr 1900, 1908) reveal a costume little different from that of the 1920s (Blom and La Farge, 1927), the 1940s and 1950s (Hernanz, nd; Haab, 1956; Duby, 1961), the 1960s and 1970s (Laughlin, 1969; Villa Rojas, 1969; Vogt 1969a, 1969d; Cancian, 1974). It had probably developed its current form during the period between the end of the *encomienda* (1720) and the advent of the coffee plantations (say 1870) in the *tierra templada*. Which is not to say that it hasn't changed. The huge *chamarras* photographed by Starr that reached to the feet of the Tenejapa and Chamula not to mention the nearly full-length *huipil* worn by the Chamula women (1908, 366), have shrunk to knee-length, or less. The heavy Indian-made hat worn by the Chamula twenty years ago is gone, replaced by a store-bought article. The area of the *huipil* brocaded has decreased, and the individual motifs have grown larger and often cruder. Lost forever are the rain *capas* of woven straw or cornhusks that made the Indians look like strange gigantic birds and much of the costume of the northern Tzeltal, particularly in the Ocosingo Valley. Commercially-made *manta* has replaced the home-loomed variety for most of the men's undergarments and has made significant inroads in the rest of the costume. Pants of the Mexican variety not seen on any highland Indians in San Cristobal fifteen years ago, now seem to be worn by half the males who come to town, and are worn increasingly at home as well. Rubber hat covers and rain ponchos are worn everywhere, and blouses of the commercial sort are increasingly seen in even the most conservative communities. In Cancian's photos (1974)

(1974) can be seen an indication of the nature of this process. The Zinacantecos adopt ladino clothing exclusively in the lowlands where they go to farm; cowboy hats keep off the sun, pants keep the legs free of lowland insects, and tee-shirts, work shirts, belts and sandals complete the costume. Closer to home they wear these clothes less often, but even in the home-compounds pants are worn by the younger men and boys, beneath their red and white striped poncho. It is at the heart of the uniquely Zinacantecan experience that the costume is still almost inviolate: at the major fiestas and other ceremonial occasions, although in his photos of these (as on page 29), even here before the church, as many men can be seen wearing pants as not.

This last phase of change began in the middle of the 1950s, shortly after the Pan American Highway brought the region into close motorized contact with the rest of Mexico, and has accelerated through the 1960s, affecting most rapidly towns close to the highway and open to change. It could be seen in the Omega wristwatches that every Indian seemed to sport, in the Columbia S.A. estereofonografias that sprouted in towns with electricity. During the sixties electricity and decent all-weather roads reached nearly every town in the highlands. The National Indian Institute with its extensive programs reached into every paraje, and in cooperation with other national agencies carried out continuing and expanding efforts to control erosion, educate the children and inculcate them with a Mexican awareness, improve sanitary conditions, control diseases and so on. As it has changed in response to each preceding change in the life-style of the Indians, the costume is also changing. Inexorably it is losing, and will continue to lose, its sempiternal and place-specific character, and as the Tzeltal and the Tzotzil are absorbed into the mainstream of Mexican nation life, and as they lose their central position in the cosmos, so will their costume be absorbed into the mainstream of fashion, except as it is preserved, like a hapless fly, in the amber of the ethnographic museum or the pages of papers like these.

PROCESS AND STRUCTURE INTO BEING

There are a couple of other filters through which the costume of the Tzeltalan has passed on its way from its dim beginnings to you, and those are me and you, my ability to see and make, my ability to make seen, and yours. We are like the Tzeltalan faced with the world who see and make patterns on their clothes and patterns of their clothes, only we are faced with the clothes of the Tzeltalan instead of the whole damned world. It's a complex business, this seeing and making, and I don't know how much farther along I am in making sense of the patterns of the highland costume than I was on that crazy morning in July when it first burst upon

me like all the suns in heaven in its splendid chaotic richness. But then that doesn't really matter, because there is no end to seeing and making, not as long as the game's afoot and the sun rises and sets. The seeing and making of patterns is the nature of the beast: birds do it, bees do, oysters on the bottom of the sea do it...

I am typing this on a machine with even spacing. There are just so many spaces across the paper, and each may be filled with a mark, or left empty, like the space after this period. These spaces are like warp threads, delimiting the range of possible locations of marks on the paper. Across them I weave in alternate lines, for I am double-spacing bands of marks. The order and nature of these marks are described by the nature of these marks are described by the nature of the English language, the range of marks available on this machine, and what I have to say. The patterns on this page, this weaving, is the result of an interaction between my media, the language and machine, and what I have to say, which is in itself the result of the interaction between the Indians, what they saw, what they made of it, and their only world, the sum of all the seeings and makings that there are. So recursively we gyre in these skies of seeing and making, making and seeing, hobbled by our inability to penetrate to that core--cognitive and human--where they are not distinct and separate, but identical and unitary, perception and generation cognitively interlocked in the active organic engendering of making something seen.

When the physicists of this century made the discoveries that light-waves were composed of particles, and that particles, or quanta, of light behaved as waves, they never hesitated in nominating the wavicle to take the place of both waves and particles. But we are not tarriant. Long have we had a term that weds structure to process, seeing to making, perceiving to generating. Writing or weaving we are busy, being.

Unbelievably, and coincidentally, outside it is raining.



Raleigh, North Carolina
14 January 1975

NOTES

1. This terminology is borrowed from the work in what is called artificial intelligence, an area of investigation concerned with modeling the human intelligence with the goal of simulating it on computers. One problem of particular importance is the creation of computers that can "see" or, more accurately, cognize, a stimulus field. What is at stake is ability of the computer to create pattern rules that will allow it to order the field. Thus, presented with a field (likely a digitization of a cathode or other display), a complex and useless collection of, say, black and white dots of varying intensity, it is necessary for the computer to "see" patterns, that is, organize the field into a collection, or set of collections, each member of which has a given attribute, or set of attributes, in common. Then it would be able to manipulate, tabulate, whatever, these "things". Thus, presented with an aerial photograph, a set of black and white dots, it would be able to "see", count, and store the houses, trees, gas storage tanks and so on. Jackson's chapter, "Pattern Perception" (Jackson, 1974, 169-212), goes into this question in some detail. Likewise informative is Heinz von Foerster (1969).
2. To the best of my knowledge this exhibit no longer exists, having been destroyed in the calamitous fire that took La Segoviana in late 1968 or early 1969. The proprietor, Joaquin Hernanz Humbrias, did not replace it in his new shop. At the time of my first visit this was the only such exhibit in the world. In the unduly famous collection at Na Bolom the emphasis was on their collection of artifacts. In the Museum of Anthropology in Mexico City the emphasis was still essentially archeological, an emphasis more than rectified in the new unrivaled museum. During the fifties and early sixties Joaquin Hernanz Humbrias was probably one of a handful of people most conversant with the material culture of the Tzotzil and Tzeltal Indians. His collection of photographs (lamentably destroyed, for the most part, in the same fire) was extensive and important documentation of the period between the first visit of Blom and La Farge and the return of Blom with Gertrude DUBY. His collection of costumes, similarly fated, was more than impressive. It was from his shop that many of the pieces in other collections were acquired. It was to his shop that Indians brought the better pieces that they had to sell, items of unusual quality or antiquity. He was and remains a weaver of distinction, and important citizen of San Cristobal las Casas, a friend and student of Indian culture, and a man who stands high in any recent history of this region.

3. Years later, when I had more completely digested the situation, I realized that my Chamula poncho was made, most likely in Guatemala, but possibly in Comitán. In either event it is neither Tzotzil nor Tzeltal. The Chamula never sew up the sides of their ponchos nor add patch pockets to its surface. None of this was, however, known to me at the time, having on my first day in San Cristóbal failed to comprehend the invariants that defined the pattern of the Chamula poncho. For a few years, as my understanding grew, I believed I had a rare example of Chamula deviance, but I am forced to confess that my first and favorite item of Tzeltalan clothing is not that at all.

4. It should be noted that not all the highland communities clothe their saints in their own costume, and that no community clothes all its saints in the community costume (see Vogt, 1969d, 353-361 for a description of the saints of Zinacantan), though most of them clothe nearly all of them with some articles of native dress and a few entirely in costume. In Chamula practically no items of the costume appear and the saints are dressed in gaudy printed cotton with mirrors hung around their necks or (rarely) sewn onto the cloth itself. Boyd described a similar situation in New Mexico: "As colonial economy shifted from barter to cash and rural standards of living declined, the villagers continued to dress their favorite Santos in whatever they could find: machine-stitched calico Mother Hubbards, beads, crochet sacques, a doll's hat, tinsel and any other offering at hand. Currently, country chapel images are seen decked in necklace and bracelets of plastic lacing or rayon socks" (Boyd, 1959, 35-36). It should be noted that the Chamula are among the poorest, if not that, of the highland groups. On a slightly different tack, it might be noted that the emphasis on cleanliness includes the very crosses in the churches, which are wrapped in cloth and bound like mummies. Franz Blom (oral communication) suggested that this was to keep them clean of 'cosmic dust', but I cannot, unfortunately attest to his seriousness at the time.

5. On the other hand, this variation may fall into the category of signature and property marks identified originally Osborne (1935, 57) and further discussed by O'Neale (1945, 98). O'Neale says that it is usually only the placement of the motif that qualifies it for membership in this category (often near the edge or bottom, but always isolated from the balance of the design) but I might add as a criterion the characteristic of violating the axial symmetry of a design. Both types of marks (symmetry violators and those

located at edges away from the design) are frequently found in highland costumes.

6. Nearly everyone seems to agree that the design elements are symbolic, but of what, no one is willing to do more than tentatively guess. After saying, "From our point of view the difference in styles from one municipio to another are often slight, especially in women's dress, but from an Indian's point of view they are symbolically very important" (Vogt, 1969d, 590), Vogt vouchsafes no indication as to what these might be (unless he meant that the difference—hardly as slight as he suggests even among women's dress) are symbolic, as opposed to the design elements themselves.) But then neither does anybody else. And nor shall I, as significant and thrilling as such investigation is. The reason for this silence lies in the magnitude of the task. Coe describes what is involved in his discussion of the jaguar in Olmec iconography (1972, 1) which I shall rephrase in our context. First, a formal iconographic investigation of highland art is required (including pottery, wood work as well as costumes). My work, of which this is a preliminary report is a beginning, but the field is vast. Second, is a description of the natural history of the highlands (including man) providing the background out of which mimetic forms might have evolved. This work is and was been carried out in the anthropologic work, but more work is needed along the lines of Blaffer's study, investigating the actual character of highland (or Mayan) flora and fauna. She reaps a significant harvest from her study of bats, hummingbirds, butterflies and other things (Blaffer, 1972). The third thing that is required is an analysis of the relationships between men and their environment (see Blaffer, also Vogt in his concern for the relationship between the Maya and mountains; and so on). Fourth, a genetic analysis, such as is hinted at in the fourth part of this paper, is vital, to establish when and where what iconic elements entered the system. Finally, it all needs to be interrelated. Nothing less is demanded than the interpretation of the "language" of the designs. I would merely make some tentative suggestions here toward a decoding of this language. I am struck most by the resemblance between the lozenge with its stepped sides and the cosmic-mountain-pyramid image (Vogt, 1969d, 593-604; Villa Rojas, 1973, 135-143). It could be accidental, but the predominance of both sets of elements suggests that it is not. Next I am struck by the former cross representation of the four cardinal regions (Villa Rojas, 133) and a recurring motif in Tenejapa, that has eight arms (grecas in fact) devolving out of a central lozenge. A highly anthropomorphic figure that appears on

the ceremonial sash and cap in Tenejapa strikes me as a representation of the Black-man of Zinacantan, which may be a figure widely dispersed (especially if Blaffer's analysis is correct). And so on. These are all conjectures of the very wildest sort, but such is the state of the art.

It should be noted that only in the case of two-woof strand zig-zags can the zig-zag be generated by the two identical (OIOI) rows out of phase half a cycle. In every other case, only the top and bottom rows (creating the peaks of the pattern) are out of phase a half-cycle. The other intervening rows do not have the same binary code as these, since they will have to show color twice for every peak (once on the upstroke of the zig and once on the downstroke of the zag. Thus for a three-strand zig-zag, the top and bottom rows are IOOOIOOOI out of phase with respect to each other, while the middle row is IOIOIOIOIO, out of phase with both others. This results from the fact that the number of spaces in the outside rows is twice as great as those in the inside (that is, IOOO has twice as many units as IO), and soon.

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